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SEASON'S GREETINGS

As the joyous season of Christmas approaches, the publishers and editor of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION extend to all of their readers the wish that has sounded throughout the Christian era — Merry Christmas! May the peace and good will brought to us by Christ centuries ago, permeate once more the hearts of all.

For the New Year, too, we express the hope that prosperity, health, and happiness be the portion of all our friends.

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January, 1938
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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

With Industrial Arts Leading

F. J. Moffitt

Superintendent of Public Schools, Hamburg, New York

A superintendent indicates how logical and necessary it is for industrial-arts teachers to assume leadership in the effort to fit education to present-day needs.

As the visitor to the modern school leaves the quiet drone of the classes in Latin and tiptoes past the studious buzz of the school library where warning signs plead with him for silence, his ear catches a hum of activity and a bustle of subdued noise. The atmosphere changes. It is electric with purposeful energy. Unconsciously he steps forward at a brisker tempo.

"Where now?" he asks the student guide who has been assigned to him.

"We are coming to the industrial-arts department," says the youngster beaming with the pleasure of showmanship and the knowledge of surprises in store. "Here is where we do things."

Stepping into the rooms where the industrial-arts program is being carried on, the visitor looks with amazement and wonder. Truly, the days of the little red schoolhouse were never like this! A happy, alert group of boys and girls are intent upon a fascinating variety of tasks. There is a businesslike air of workaday efficiency, a sense of achievement, a swing of resourcefulness. The visitor sees the modern educational philosophy at work — with industrial arts leading.

With the social, economic, and industrial life of a great democracy gradually recovering from the economic paralysis of several years, there has come to the schools of the nation an increasing demand for a departure from outmoded procedures that have offered a one-sided education. The patrons of the school have sensed the inadequacy of training which prepared for entrance to college only, and are insistent upon a revision of the school curriculum which will touch life more concretely. The educational *slack* is being taken up.

Education in a democracy moves slowly and the lag between school and the life outside has been the despair of educational administrators. How to weed out the timeworn subjects that clog a school curriculum built for an educational plan of twenty years ago is no simple problem. Life outside the schoolroom has changed utterly. How must it change within? In the increasing growth and vitality of the industrial-arts movement, many educators have found a partial answer.

There is a significance in the growth of industrial arts that carries a challenge to the supervisors and instructors in those subjects. If the school is to meet present-day demands and the needs of the future, the next ten years will see even more interesting changes. For many years, education has been attempting to fit 90 per cent of the students for *white-collar* jobs. That type of job is becoming increasingly nonexistent. Positions in the business and industrial world demand an enlarging technological knowledge and the industrial executive thinks of himself as a practical, not a *white-collar* man. The school can no longer be content with educating for the so-called professions only, but must reach out into other fields. The increased growth in secondary-school enrollment, the longer number of years that young people are remaining in school, the demand for more apprenticeship training which can no longer be given haphazardly on the job itself, the cry of employers for assistance from the school — all these factors are forcing educators to turn more and more to the teaching of industrial arts as a solution to the problems that beset them.

It is dangerous to prophesy concerning the education of the future. Yet, those connected with the school have seen for a number of years that the educational plans built for an era that has been swept away must be remodeled to meet the years ahead. The economic catastrophe taught the lesson to education that there must be more preparation for life as it is and better adjustment for each youngster into the actual situation where he will eventually find himself. The older-type school

Young people today are electing courses for which their parents yearned in vain

The printing industry is sending out a call for candidates with some preliminary training

struggled against the change, the *classical* scholar fought for the peaceful noncontroversial studies of yesterday, the colleges tried to withdraw into the scholastic medievalism that scorns actualities. But such a course could not command the support of a people who have ever insisted that education must be given to all of the children.

So came the teaching of industrial arts and kindred subjects. So came the trade and apprenticeship schools. So came, at last, a change even in those secondary schools which prided themselves on teaching for an artificial standard of college entrance. Institutions of higher learning followed the trend slowly at first and then, as the value of the new procedure became apparent, with increasing speed. Today we see this evidence of change in curriculums everywhere, and of increasing confidence that education is adjusting itself to modern life.

The challenge to the industrial-arts advocate to assume a militant leadership is apparent as never before. In every field of education there is demand that he equip himself so that he may guide and direct his full share of the educational program. New teacher-training courses are being set up for him, new standards of scholarship are being applied and new encouragement is offered him in his quest for educational leadership.

Outside the school, business and industry are urgently asking for the counsel of the industrial-arts leader. Many of the trades have reached the point where the supply of well-trained workmen has fallen away and where the apprentice trained in an older social order is no longer available. With the quickening tempo of industry, there is a vain search for skilled workmen. Industry makes increasing demands upon the school to provide a training which it once undertook to offer itself. The printing industry, the electrical workers, and the automotive fields are sending out a call for candidates with some preliminary training that they may the more quickly fill the ranks that have been depleted by the abolishment of the old apprenticeship system.

In other areas of education, the call is insistent. The leader of industrial arts will do well to examine the fields wherein he may make a needed contribution.

In educational administration, there are a number of trends which point to a demand for new leadership. The definite swing toward centralization of schools presents a challenge to one who is trained in industrial arts. Hundreds of young people who have never had the advantages of well-organized secondary educational programs are being brought together by school centralization. In former years many of these youngsters attended a district school for the minimum amount of time demanded by the law and left at the end of a common-school education to enter into indifferent success as farmers, or as hired help to work in an economic serfdom which augered ill for a democratic people. With the coming of better methods of transportation and the resulting system of better roads, there are springing up everywhere in the nation larger units of school administration. Young people today are electing courses for which their parents yearned in vain. Home economics, art, music, agriculture, and the industrial arts are in demand. The type of school administrator trained in the static conventions of scholasticisms is neither able nor desirous of directing these young people along the paths which will lead to their greatest usefulness. School executives with broad training in the philosophy and materials of industrial arts are needed. Only they will be able to guide the centralized school programs into full usefulness.

In the cities and the villages of the country, the enrollment of secondary pupils

Printing — a lesson in spelling, reading, and arithmetic, with hands and brain allied

shows a constant growth. Happier economic times have shown little tendency to slow down this growth nor is there evidence that the situation will ever again revert to the status of a few years ago. Child labor laws, agitation for better training for industry, an awakening social consciousness, shorter hours of work, a renewed faith in the efficacy of educational training; these things tend to hold in school, hundreds of young people who, formerly would have been plunged into the economic struggle before they were well prepared to assume the burdens. These students need the particular aid that the industrial-arts work can bring to them. They need the special leadership which the exponent of industrial arts, by his training and ability, is prepared to offer. They will need increasingly widened courses in industrial arts and the sympathetic guidance of those who understand that field. More and more will the administrator of the larger school system depend upon the supervisor of industrial arts in remaking the curriculum of the school so that it may be brought in line with the trends that the democracy is insisting upon.

The activity program which permits learning by doing has gained wide acceptance

Evidence for this prophesy is not difficult to find. It may be seen in the enlarged federal and state appropriations that are being made available by lawmakers without suggestion or pressure from the school itself. It is evident in the enthusiastic discussions which center around the teaching of industrial arts and kindred subjects and the demands which are made upon boards of education for an expanding curriculum by enlightened citizens. Industrial arts is coming of age. The criticisms made in its infancy that it is impractical or that it is an inferior type of educational program are no longer heard. The teacher of industrial arts no longer ranks below the teacher of Latin in the councils of the mighty. Indeed, it is the older curriculum that is on the defensive and feels called upon to justify itself.

The apprenticeship system was sufficient unto the day that called it forth. But just as today no one "reads" law and thus becomes a member of the bar, so is it impossible for an old type of apprenticeship training to offer the necessary skills which will present a candidate properly equipped for the craft he wishes to join. Thus we have this awakened interest by the industrial world in support of the teaching of industrial arts. Not only will the demand increase for more trade schools, but there will be an increasing request that courses be offered by every school to teach the appreciation of the art that lies in working with the hands and brain allied. More apprenticeship training for the trades and crafts is being taught in the schools today. More appreciation will be taught tomorrow. The supporter of industrial arts has always stressed this teaching of appreciation. There are hundreds of little printshops and woodshops in the schools today that have neither equipment nor the desire to send out master printers or woodworkers. Their business is to teach the boys and girls to become more intelligent consumers, interested in the art and craft which goes into the skills of fine workmanship. The teacher of industrial arts has blazed a new field in education and he must lead the public to a keener realization of how deeply that field fits into the trends of the time.

Adults come back to school, not to renew their lost acquaintanceship with Greek and Latin, but to enter courses in industrial arts

In the elementary schools of the country the past fifteen years have seen a new philosophy come into practice. The "activity program" which teachers "learning by doing" has gained wide acceptance. In its conception, the activity program is closely allied with the philosophy that motivates the industrial-arts movement.

The elementary-school supervisor who still thinks only in terms of the three R's must give way to a leader who has a

Who is better fitted to enter upon this new adventure in guidance than the instructor of industrial arts

clearer conception of the processes and materials of manipulative participation. This field for workers in industrial arts on the elementary-school level is an expanding one. The demand for new leadership of the elementary school can be filled only by those whose philosophy of education has been gained through a sympathetic understanding of industrial arts.

Other fields in education are opening in similar fashion. Guidance came into the classroom through the industrial-arts department. In many schools today, the only type of guidance offered to the boys and girls is the vocational guidance that is presented by the busy instructor of the industrial-arts department in his spare time. But schools are asking for more than mere vocational guidance. Educators want a well-rounded program which will reach into every phase of the children's needs. Who is better fitted to assume leadership of this new adventure than the teacher who has learned his techniques in the diversified training that demands both high scholastic background plus practical experience in the work of the world?

Fortunate the small school system which, having a limited budget for its guidance work, has placed the guidance efforts in the hands of the instructor in industrial arts. The field of guidance is largely unexplored, the techniques are unknown, guidance experts are limited. But every school system which has a well-organized department of industrial arts, need not look too far afield for workers who are competent and who have some preliminary training.

The adult-education program, too, looks toward the industrial arts for assistance. Classes in adult education are springing up in every community. In their attempts to meet the responsibilities that have arisen due to the demand for more education for adults, educators have offered diversified programs. But the enrollment for these programs shows a significant trend. People come back to the school not to renew their lost acquaintanceship with Greek and Latin, but to enter the courses in mechanical drawing and woodwork.

These patrons of the school must be provided for. Who can better lead them than the instructor in industrial arts? By training and temperament, he is well fitted for the work.

These are but a few of the examples of the importance of industrial arts in the educational world. The challenge to the leader in the industrial-arts field is clear. He must realize that his day of triumph is at hand. And realizing this, he must fit himself for the leadership that will come to him whether he seeks it or not. How shall he thus fit himself?

It may be done by renewed training and education. The leader in industrial arts cannot afford to be satisfied with the training he received a decade ago. His field is expanding too rapidly. If he has not taken time to acquaint himself thoroughly with the principles of educational administration, he must make up that deficiency as soon as possible. If he is not thoroughly conversant with the philosophy of modern education, he must look to his professional reading and take time to acquaint himself with the broader principles laid down by educational leaders.

There should be more industrial-arts clubs for the teachers so that the instructors in the field may gain mutual help and information. The industrial-arts worker can neither ignore the professional organizations that function in his field nor those in the more general educational areas. He needs the broadest possible educational viewpoint. The teacher of industrial arts must equip himself much more thoroughly than he thought was needed a few years ago. He may hold closely to the field wherein he was trained, but he must also be prepared for leadership in general educational endeavor.

Education is growing and expanding as never before. The clouds of a depression have rolled away. Make no mistake about it, Mr. Industrial-Arts Instructor, there will be larger educational budgets in the next few years; there will be more demands from the public for educational growth and greater sympathy with the educational program.

Education is going forward — with industrial arts leading.

IN THE SHADE OF THE OLD SHOPROOM DOOR

In the shade of the old shoproom door
There are shavings all over the floor,
And the odor of pine
Is like something divine
While machinery like music doth roar.
A progress chart hangs on the wall
Showing where students succeed or fall.
Little marks there I see
Making lads' destiny
In the shade of the old shoproom door.

In the shade of the printing-room door
There are ink spots all over the floor;
There are gadgets and type,
Boys who clean up and wipe,
Typesetters, press feeders, a score.
Someone paid out a fortune in gold,
That ideals, growing children should hold.
They're objectives in view
As the paper feeds through
In the shade of the printing-room door.

In the shade of the auto-shop door
There are grease spots all over the floor;
Drills and wrenches and jacks,
Creepers for weary backs,
Open motors which students explore.
They may find how a gas-engine works
And the reason a car stalls and jerks.
It's not wrenches and tools,
But they're teaching life's rules
In the shade of the auto-shop door.

In the shade of a thousand shop doors
There are things cluttered up on the floors.
There are teachers in charge
Training youth by and large,
Many mysteries and truths to explore.
It's not just the salary they take
But service for fellow man's sake.
Leave all joking behind,
The best teacher you'll find
In the shade of a thousand shop doors.

— *Orville Hayford*

Socializing Tests and Measurements

William L. Hunter

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The conclusion of this article which started on page 405 of the December, 1937, issue.

A point not to be overlooked is that far too many test questions are very poorly written. Fully one half of the objective test questions devised by the average teacher aren't objective at all. They are poorly stated, ambiguous, written in such a way that the clever student gets a hunch as to what the right answer is, contain double negatives, will not be answered the same way by various authorities, and so on. Surely, if teachers are to attempt to inculcate in their pupils the virtues of precision, exactness, and care, then they, too, must practice them. "The best teaching method," someone has said, "is a good example."

Is the work which the average teacher turns out as exemplary of socialized conduct as possible? Do we treat pupils justly when we impose examinations on them which they know aren't of much account? To be sure, we are all human, but some of our test questions are so full of holes that they are humorous.

A psychology professor in discussing the subject of "mental defectives" with his class, asked the question, "How can one distinguish between a moron and a person of normal mentality?" The prophetic answer given by a near-failure in the class was, "By the questions he asks."

Then, too, one must not fail to take into account, the purposes for which tests are given. Are these, if they were actually accomplished, really worth while in bringing about a more ideal social democracy?

To be sure a great many tests are given with no evident purpose in the mind of either teacher or pupil. Some folks just do anything that they see other people doing whether they have any reason for it or not. A famous movie star wears high-heeled shoes, and so a majority of our women do the same in spite of all the advice of chiropodists to the contrary. Likewise with educational procedures; some educator does something just to be different, and before long a great many teachers are doing the same thing for no known purpose. Testing just for the sake of testing without doing anything about it afterward is just the best way that could be devised for wasting time and energy.

Motivation Through Tests

Many educators use tests and measurements for the purpose of motivation. Especially is this true in courses which are required or have been mandatory. In new and elective subjects, there aren't many examinations. Why? Well, one doesn't beat a mule if he isn't tied to a hitching post. In extracurricular work, summer-camp work, and hobby groups, one just can't find the group leaders resorting to formal tests. The only place a test is made is where some badge or diploma is held out as bait, or where one gets the pupil haltered by some law, precedent, or prestige. Once the halter is on the pupil, then the quality of instruction may be lowered, and when that happens the interest of the pupil ceases. However, the halter is still on the pupil, and in order to make him drink water from the pedagogical pump, some teachers proceed to "motivate" him with tests and measurements.

One graduate student, who took a required course which was lorded over by a 20-candle-power instructor, stated that five books were assigned for careful term reading. Each of the books contained more than 500 pages. Three were in relatively fine print. There were approximately 250 students in the class, and each student was assigned to a seat with a certain number. The instructor knew few of his students personally. Every three weeks, he gave a true-false examination of 150 statements taken verbatim from the text assigned for the period. A great deal of cheating was in evidence at every one of these examinations. Anything to beat the instructor was in order. Some copied from their neighbor's papers; some hired a bright person who had passed the course with a good grade to sit in their seat and pass the test for them; some used concealed notes; some had bribed stenographers to get them advance copies of the test, and so on. Oh! What motivation that halt, lame, and blind instructor employed!

An ancient gem of wisdom reminds us that, "He who would kindle another must himself glow." Can teachers teach pupils the love of wisdom unless they themselves love it? Can pupils be induced to enjoy drinking stagnant water? Can pupils be motivated with senseless tests and yet kept sane and socialized?

Aptitude Tests

Another purpose in using tests and measurements and one which has appealed especially to the vocational group has been that of aptitude discovery. More than 2,000 years ago, Plato wrote, " . . . it follows that all things will be produced in superior quantity and quality, and with greater ease, when each man works at a single occupation in accordance with his natural gifts. . . ." The idea of everyone in society making his living at the one occupation which he likes best is an enticing one. Also, the problem of devising tests which will automatically indicate which persons are naturally gifted for the various occupations in life, is one that captivates the educator's imagination. During the world war, the tests-and-measurements authorities did their best to set up index criteria so that the soldiers could be classified for the occupations which they could perform most effectively, thus enabling the war gods to bag the enemy with the greatest of ease.

Much roily economic water has run over the educational dam since those insane subterfuge days of 1918. Many more industrial changes and scientific discoveries have come about within the past 125 years than in previous centuries back to Plato. What person in a production belt factory can we find who is in love with his work? Plato's aptitude concept was valid for the craftsman era when the little shop or factory was operated by a single family or small group of workers. They loved to ply their trade. They were eager to establish a reputation for craftsmanship and integrity. The producers of a product were likewise the sellers. From early morning until late at night, the craftsman stuck to his last. Why? Because, thereby he found outlet for a variety of aptitudes and abilities which made the blood of true craftsman's pride flow the faster in his veins.

Today in the production world, responsibility is delegated. No man in a factory can say that the product belongs to him. Many hands make easy work, but many mouths reduce the size of the servings of a pie. No matter how much aptitude a person has for putting nut No. 496 on a tractor, he just gets beastly tired of the job after he has done that task alone at a fast clip for the thirteenth running day. Most folks today must earn their bread and butter by the sweat of their brow and must trust that somehow the opportunity for enjoyment of life will be given to them during their hours of leisure. Even in professional pursuits there is so much organization, institutionalism, red

tape, mechanized routine, and compartmentalization that outlet for natural aptitudes must often be sought in out-of-office hours.

Is the aptitude assumption one that is still good as a basis for tests-and-measurements purposes? Yes, I think so. A grain of common sense must be used, however, in devising the tests and in interpreting the results obtained with them. Most aptitudes are extremely difficult to measure in any valid sort of way. Various tests of the same aptitude often disagree. An aptitude is something that is yet undeveloped; however, tests seldom make record except in terms of learned abilities.

When too much emphasis is put on individual differences, the product of our schools is not able to adjust itself to a complex social environment. The greater the complexity of human relationships, the more does the development of individual differences tend to become a handicap. Too much eccentricity and individualism are to be discouraged, likewise, must we steer clear of mollycoddle procedures which produce only puttylike graduates devoid of spirit and courage.

Some scholastic aptitude tests have been used to divide pupils into speed groups. The bright pupils go at a certain rate, the average pupils at an average speed, and the dull pupils go along at a snail's pace. Such use of tests is to be deprecated. Civilization will advance only as the whole of humanity advances. The general who gets out in front of the army is soon shot down. The bright pupil must, all through life, work with the dullard and be sympathetic toward him. Our leaders in a democracy must, in every sense of the word, be humane. Our dullards, too, must appreciate the value of intelligence and be able, through the ballot box, to choose those who will handle the reins with justice to all. Only by working together in the classroom and playing together on the field of sports can the bright and the dull, the weak and the strong, come to understand and appreciate one another.

Diagnostic Tests

Yet another purpose of tests is to locate pupil difficulties or needs. This is a very fine purpose if real needs and essential difficulties are discovered, and if pupils are motivated from within to meet the needs and overcome the difficulties. Too many tests, however, are given with the seeming purpose of proving to the pupil that he doesn't know much anyhow, or that he does not know so much as the teacher does.

Comparatively few teachers use tests as a teaching device, rather than as a testing device. One industrial-arts teacher puts up a new sheet of objective test questions on the bulletin board each week. His pupils question each other; they look through books, inquire of their parents, and from every available source attempt to find out the answers to the questions. This teacher makes use of the test as a teaching device, and it works admirably. It is necessary, of course, that the knowledge which the test is to convey, is relatively important. Another industrial-arts teacher has developed some crossword puzzles related to industrial arts. These appear to be of great interest to the boys. Insofar as they assist in fixing important ideas, facts, or concepts in the boys' minds, they may be considered worth while. Tests which leave the pupil no wiser for the experience of having taken them, are of questionable value in general education.

The socializing influence of tests can always be questioned when procedures are developed in children which are not compatible with methods of procedure in the more ideal ways of human living. For instance, in the better of ordinary life situations, do we live through the cramming process which precedes many test situations in school? Does the average successful individual put himself under great mental tension once a month or twice a year and cram for meeting the problems of life? Does he? Or does the average successful individual study himself and his environment from day to day, the better to change himself and his surroundings for a more perfect existence?

Many tests which can be used by the pupil to evaluate the outcomes of his own efforts to learn are most urgently needed. People of all ages learn best when they can measure their own rate of progress with each succeeding effort put forth. When no criterion of progress is available, people will continue to work in the dark.

Checking Tests

Some teachers have been found who permit the pupils to check the answers to their own tests as soon as the test is completed. This has the advantage of enabling the pupil to correct a wrong response as soon as possible after the response has been made. Also, a right response can be fixed even more firmly. Some teachers object on the ground that pupils will not score the papers fairly. It seems to the writer that this all depends upon the extent to which the teacher respects and trusts his pupils. Where there is no teacher faith in humanity, there is no pupil faith in the teacher. With a few possible exceptions, pupils are just about as honest as are their teachers.

Some teachers discuss the test with the pupils and bring out the reasons for a certain question being answered this or that way. Much teaching is thus possible, provided the test was of real worth and contained valid content to begin with. Certainly much more good comes from such procedure than when a long period of this time elapses between the giving of the test and handing back the papers, or when clerks, who know nothing about the tests or the pupils, do the scoring.

Yet another good purpose of testing is to enable the teacher to measure his effectiveness as a teacher. Too many teachers have looked upon their own procedure as having no flaws. Other teachers look upon pupil failure as a reflection on themselves. Certainly good teaching will never be adequately rewarded until some adequate measure of the quality of teaching is available. The good doctor gets better pay than a poor one does. Likewise the good lawyer or the good engineer. Not so in teaching; the poor teacher draws nearly as much as the good teacher, and this will forever be true until some criterion of progress is available.

Let us not deceive ourselves, however. In one city with which I am acquainted, there are several industrial-arts teachers. A testing program has been in effect for several years. The industrial-arts supervisor informed me that he was certain that the quality of teaching by the members of his department was increasing rapidly. I pressed him for a reason for his answer and he said, "Well, each year the industrial-arts pupils make a higher average score on the standardized tests which we have been using."

Let us not be too certain. Both cause and effect may be only apparent. First, did the standardized test really measure all of the factors going to make up quality of teaching? Secondly, may not teachers either intentionally or unconsciously have placed greater emphasis on whatever the standardized test contained simply because they knew their supervisor?

Too many educators place too much faith in norms. Tests can be reliable and yet not be valid. The use of norms presupposes like needs and a single variable. Like needs seldom exist, and whenever teaching situations are so mechanized that only a single variable operates, then teaching just isn't, that's all.

Personality

Tests have been used for measuring the personal and social habits of pupils. Certainly there is much need for emphasizing the habits and procedures of people which enable them to get along with one another. The old idea of personality, for instance, was that it was a quality handed down very largely by heredity. This faculty or trait idea was an outgrowth of a psy-

chology which conceived of the brain as made up of several parts. One part of the brain was thought to control a certain area of human actions and another area controlled some other phase of our existence. Today, personality is thought to be a complex entity. Nearly everything that we do reflects our personality. Personality is the other person's reaction to us. If we behave ideally in the other person's estimation, then we have a good personality. Hence, we must study each little item of our behavior that vexes other people and attempt to discontinue that which displeases and repeat that which others like in us. To be certain, this can be carried to excess. We need some ideals of conduct which we believe are right, and if we are certain that they are right, then we should stick to them through thick and thin.

Tests for the measurement of good personal and social habits should be used with discretion. Pupils should not be given inferiority complexes. Most folks are very sensitive about some items of their conduct. Most folks want to be liked in one way or another by their fellow men. When tests are used with discretion, not to get something on the other fellow, but as a guidepost to better human living, then much good will result.

The good individual is the one who, no matter how poor he is now, is on the way up. He is improving from day to day. He has right ideals. To be sure he stumbles now and then, but each time he gets up with renewed determination to do better the next time. The undesirable citizen is the one, no matter how good he is now, who is on the way down. He gets worse from day to day. Each day he stumbles a little farther into life's gutter of unsocial conduct.

Insofar as possible, schools should challenge all pupils, no matter where they now are on the scale of academic success, to keep on improving and laying each block of our democracy in such a way that the most glorious edifice possible will be constructed.

Importance of Personal Relationship

Too many times tests have been used as a substitute for personal contacts and conferences between pupil and teacher. When this takes place, then we can certainly question their social value. When tests or projects, or exercises or mere bookwork or instruction sheets, or busy work of any kind, are used largely to eliminate the human-relationship part of teaching, then teaching isn't teaching; it's simply routine. Scores on tests or number of problems done, or the quality of exercises completed, are always secondary to pupil growth. Real education is creation, growth, discovery, synthesis, development, life, regeneration. Real education is not easily measureable by mechanized tests. Whenever education is reduced to training, to pouring in, to storing, to absorbing, to telling, to fixing, or to drilling, then many tests can be used, but real education hasn't taken place.

The attitudes, the ideals, the interests, the inspirations, the great values necessary for success all through life are values which come from contacts with great men and great women whose lives have been lived fully.

Certainly many tests are needed if industrial-arts teachers are to measure all of the values which come from real education. Much intelligence, discretion, and common sense are needed in order to devise and use tests in ways that will be of greatest ultimate value in the evolution of our democracy. Today's pupils are tomorrow's citizens. You and I, as industrial-arts teachers, have in our hands the most valuable raw material which it is the privilege of any profession to work with. May you and I, as teachers, twenty years from now, be justly proud of our product.

Boat Lumber and Decorative Cabinet Woods

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A love of beautiful wood is the mark of the true craftsman. This article is written for craftsmen, by one who knows and loves beautiful woods.

There are a number of comparatively new woods coming into the market. Many of them are imported from the tropics and run from a bright yellow to a deep purple, all colors of the rainbow. The Government engineers working on the Panama Canal found about sixty varieties of wood, all of which are commercially usable.

With our fine, native cabinet woods becoming scarcer each year it is necessary to turn to the tropics for an adequate supply. With hundreds of miles of virgin timber available in northern South America — practically at our front door — woodworkers will do well to inform themselves as to the qualities and finishing of these woods that must form our future supply.

The question naturally arises, why are not more of these woods on the market and more generally available? There are several reasons, some of which are:

1. The high cost of introducing and selling a new wood. (The hardest thing to overcome is the prejudice and conservatism with regard to a new and partially tested material.)

2. Importers cannot afford to bring in woods in quantity, until they are sure of a market at a reasonable profit.

3. There is a lack of realization on the part of cabinet-wood buyers, that such a large variety of woods can be made available, and must be used as substitutes in the not far distant future, to replace woods now commonly used.

A case in point has been the experience of importers of Philippine mahogany. This material, now generally used, has been sold on the eastern seaboard for approximately 30 years. It took 15 to 16 years of this time and considerable sales effort on the part of the pioneer importers to get it up to a paying volume. The industrial-arts teachers, students, cabinet men, and woodworkers can hasten the process of importing and the distribution of a large portion of the attractive woods now available, by getting sample lots, trying out the various color combinations, and in showing an interest in the woods now procurable. Table I shows some of the more commonly known imported woods, giving a source of supply, the color, and use of the wood.

There are some important considerations that should go into the selection, drying, buying, and finishing of cabinet woods.

Selection. The interior decorator has thoroughly covered the field of color schemes in regard to hangings, painted walls, and furniture, but little has been done in the use of the wide variety of colored woods that come from the tropics that require no staining. It is true that fancy veneers are being widely used by case manufacturers, but many of the contrasting effects are obtained by staining the

cheaper native woods. This field of contrasts of naturally finished woods has been scarcely touched. Many of these tropical woods are close grained, durable, and especially adaptable for chairs, stands, and house furniture.

Drying. Cabinet woods should be kiln dried to from 5 per cent to 7 per cent moisture content. The majority of cabinetmakers seem to find a 6 per cent moisture content most satisfactory. It might be well to say a word about how stock is dried by the latest and most scientific methods. Generally speaking, the process is about as follows:

1. The stock is piled on special trucks, with strips between the boards to allow a free circulation of air.

2. At first the stock is steamed, from 12 to 24 hours to open the pores of the wood.

3. The humidity is decreased and the heat increased according to a scientific schedule worked out for the wood.

a) This method of drying causes the center to dry out first, boils out the excess sap, and relieves internal strain.

b) The kiln-drying process permanently shrinks the cell wall, so that it can never hold as much moisture as before.

Therefore, for all cabinet work that is to be used indoors where it must meet modern heating conditions, it is well to insist on kiln-dried stock and avoid future trouble. Remember that wood is a cell structure and subject to heat and moisture conditions, more so than many materials. To control your material in cabinetwork, or furniture, the wood must be dry to start with, before your finish is put on the article. A finish does not completely insulate the wood from moisture and heat.

Buying. Lumber is usually sawed from the log in the following thicknesses (using the lumberman's terminology): 4/4 — four quarter (1 in.); 5/4 — five quarter (1¼ in.); 6/4 — six quarter (1½ in.); 8/4 — eight quarter (2 in.); and sometimes, 10/4 — ten quarter (2½ in.); 12/4 — twelve quarter (3 in.); and 16/4 — sixteen quarter (4 in.). Thin stock (¾ in. — in the rough — or less) is usually resawn from, 4/4, 5/4, or 6/4.

Random widths usually run from 6 to 12, 13 or 14 in. wide, the upper limits (12, 13, or 14 in.) vary according to the size of the log and the grade of stock. Random lengths usually run from 8 to 16 ft. The lumberman usually prefers to sell stock in random widths 6 in. and up, and random lengths 8 to 16 ft.

Shorts are less expensive per foot, than the random lengths, and enable the consumer to save, if the work does not involve too much waste. Shorts vary in length according to the kind of wood. For instance, Philippine mahogany shorts come in random widths and 6, 7, and 8 ft. lengths. Mexican and Honduras, and some of the other mahoganies, produce shorts that run from 2 to 5½ ft. in length. In some cases, *short shorts* are to be had that run from 18 to 24 or 36 in. lengths. These are quite valuable for small turnings and novelties.

As already suggested, the best way, from the lumberman's standpoint, is to order the grade wanted in random widths and lengths. If the lumberman picks all in one width or one length, he must make an additional labor charge, that runs up the cost and does not always lower the final cost of the finished product to the consumer. It is well to remember that log lengths (16 ft. or over), and wide stock (usually 14 in. and over) always command an extra premium over the price of random stock.

Finishing. In doing cabinetwork, a saving may be made by finishing the wood natural. Also, if the wood used is close grained, a filler will be unnecessary. In both instances, there is the additional saving of the time and labor involved in the processes of staining and filling. Then, too, greater depth of color, and a more pleasing harmony between the furniture and other portions of the decorative scheme are gained. If a wider range of color and

TABLE I. IMPORTED WOODS
Frequently sold direct by the importer

Kind of Wood	Color	Use	Importer
Balsa Wood	White	Insulation, Aero Models, Preservers	Balsa Wood Co., Inc. New York City
Cedar-Spanish Cedar-Peruvian	Red Red	Cigar Boxes, Racing shells & boats	Geo. D. Emery Co. New York City
Ebony Mahogany-African	Black Red	Handles, Novelties, Furniture	Palmer & Parker Boston, Mass.
Greenheart	Green	Fish Rods	J. H. Monteath New York City
Lemonwood	Yellow	Bows	John A. Hunter New York City
Mahogany-Brazilian Mahogany-Philippine	Red Red	Furniture Furniture & Boats	Thompson Mahogany Co. Philadelphia, Pa.
Mahogany-Cuban Mahogany-Santo Domingo Mahogany-Mexican Mahogany-Honduras Mahogany-Peruvian Mahogany-Prima Vera	Red Brown Red Red Red White	Furniture Furniture Furniture & Boats Furniture & Boats Furniture & Boats Furniture & Boats	I. T. Williams Co. New York City
Oriental Wood	Brown	Furniture & Fixtures	Amazon Lumber Co. Long Island City, N. Y.
Purpleheart	Purple	Arrows & archery goods	J. H. Monteath New York City
Rosewood	Red-brown	Furniture & Novelties	I. T. Williams Co. New York City
Teak	Brown	Boat trim & decks	Geo. McQueston Co. Boston, Mass.
Mahogany-Philippine	Red	Fixtures & Boats	H. J. Winde Co. Boston, Mass. Indiana Mahogany Co. Long Island City, N. Y. Powe Lumber Company St. Louis, Mo.

Note: Importers of Mexican, Brazilian, and Peruvian mahogany do not usually care to take orders for less than 500 feet.

Table II. Boat Parts for Which the Various Woods are Used

Kind of Wood	Keel	Frame	Planking	Trim	Decking	Spars	Models	Approximate Cost Per M
Cedar-Peruvian			Cruisers, yachts					$160 to $250
Cedar-Spanish			Racing shells					$160 to $250
Cedar-Red (Western			Shells, cruisers					$100 to $140
Cedar-White-Juniper			Rowboats, cruisers Yachts					$120 to $160
Fir						x		$ 60 to $ 80
Mahogany-Mexican Mahogany-Honduras			Cruisers, tender yachts	x			x	$180 to $350
Mahogany-Peruvian			Tender, yachts	x				$180 to $350
Mahogany-Philippine	x	x	All types	x	x		x	$110 to $200
Oak-White	x	x						$ 80 to $130
Pine-Idaho Pine-Southern Long leaf	x		On large boats		x		x	$100 to $150
Spruce-Sitka						x		$150 to $200
Teak-Burmese (preferred)			Expensive tropical yachts, also cruisers	x	x			$450 to $600

Keels and frames of most boats 16 ft. or longer are of native white oak. White oak lasts longer around water than other varieties of oak. Planking on small speedboats and cruisers is generally of Philippine mahogany, because the wood has a long tough fiber, stands up well around water, and is reasonable in price. For some sailboats and yachts, white cedar (juniper) is used on account of its weight. Boat plans usually specify the type of wood to be used for planking. In the case of special classes like the Star and Snipe, the specifications are rigid

beauty is wanted, these tropical woods will answer admirably. The importer will always bring in what is demanded, if he can make a profit on it.

Boat Woods

The boating industry, for a number of years has been using tropical woods for planking and trim, as well as decking. In the days of the old square riggers, and during the time the whaling industry was at its height, boat building was one of the largest industries of the country. With the advent of steam, there was a rapid decline in the amount of lumber used in boats. Now, with the increasing interest in small outboard and inboard motor boats, small sailboats, cruisers, and yachts, the boat industry is again climbing back to occupy a place in the sun. The school shop, the home craftsman and model makers are turning to the building of boat models, rowboats, outboard, and other power boats. This includes a growing group of enthusiasts who build cruisers and sailboats in the home shop, barn, or backyard. Table II was prepared to assist these amateur and nonprofessional boat builders. Table II also states the uses and comparative costs of some native and imported boat woods commonly used by the trade.

For boat work, air-dried stock is used because the greater expansion of kiln-dried stock, when used around water, gives additional trouble with planking. It has been found, by experience, that boat lumber should have from 12 to 16 per cent moisture content. Kiln-dried stock has been successfully used when dried down to a minimum of 11 per cent moisture content. Since this drying is an added expense of about a cent a foot ($10 per thousand) few care to incur this extra cost. In boats of over 16 ft. length, where an oak keel and ribs are used, these are frequently taken almost green and direct from the woods (an exception to the moisture content suggested above). A good boat builder tries to keep keel stock ahead. The ribs are steamed and bent into place, so, they are wet anyway.

Americans are an out-of-door people, and boating is becoming increasingly popular. The seashores, lakes, and streams, have fascinated all races from the beginning of time.

Just as in the selection of the design and the materials used in boat building, we give expression to our love of sports, so also in a far more intimate way, we demonstrate our color sense and refinement in our furniture. As some of the furniture of the past now seems drab and uninteresting to us, so our furniture of today will seem to the generation that is to follow, unless we get acquainted with the woods described in this article and then make the furniture of the future more beautiful.

Industrial Arts in an Integrated Curriculum

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It may be trite to assert that education is constantly in a state of flux, that it is no longer static, or that it is becoming increasingly dynamic so as to permit it to reflect, very definitely, the economic, political, and cultural life of a nation; that it can no longer be a hidebound, traditional effort to train our youth in the rudiments of primary knowledge, social conduct and life's participation, but that it is coming into its own as a vital force, *which later will affect the social order to come;* that it is slowly but surely stepping into the vanguard as a controlling force rather than lagging behind the fourth-line trenches in the warfare for social understanding and betterment.

Education Must Lead

Some may consider these statements as unduly optimistic, or as enthusiastic expressions of that which *may* come to pass but which is yet in a formative stage. Admitted that this may be true in a measure yet on the other hand *such a philosophy* of thought had better be entertained by all educators. If they neglect to do this, they will surely contribute to a retrograde movement and their inherent conservatism will slow up or even wreck the educational machinery entire.y.

There are indications that many leaders of educational thought subscribe to this *initiative* type of education rather than the *trailing* type; witness of this are the progressive-education movement, the trend to diminish the importance of "text" material and the substitution of the research attitude, the reduction of "re-citation," the fostering of the discussion method, the free selection of subject matter rather than a rigidly imposed curriculum or content, the specific attention to individual differences versus the chalk line of cast-iron conditioned reaction and inflexible molding. But there is no need to go on and prove that our educational philosophy *has already* broken away from the old and traditional and *has* substituted the relatively free for the definitely fixed.

If this premise be conceded, it will be readily understood how some of the subjects, seemingly of little import in the past, have of late years assumed a position in the scheme of things far different from that foreshadowed for them; that such subjects as music and art, using these terms in their broadest sense, have become necessary factors in the emotional development of the child; that they represent an important outlet for the inner life of the individual long suppressed by a regimented regime and a stereotyped pattern.

Social progress is best assured by the harmonious co-operation of individuals having common cultural and practical experiences. The integrated curriculum is, therefore, necessary for training the future participators of our democracy.

That such subjects contribute very effectively to the principles previously enumerated, will almost be self-evident even to the layman.

The New Subject Matter

It also will have to be conceded that the content of all *subject matter,* whatever it may be, must perforce be modified, expanded, and made available to all to serve in an integrated program for the ends implied. We may no longer make a "list of approved subjects" but all must be utilized to the end that they may contribute to the complete development of the child first, and then, if it is found desirable and feasible, these subjects must be treated more intensively as predilections rise to the surface of the turbulent and ever changing educational sea.

All this means that we have no right to think of certain subjects as "special," because that implies an attitude toward them no longer defensible on the basis of the philosophy previously expressed. If this philosophy is worth anything it must in turn call for the absorption of virtually all subjects into a working curriculum, as fundamental to the educative process. If such "special" subjects have educative values aside from any specific ones, then they must form an integral part of our educative efforts and be used so that their many and not fully appreciated values may be taken advantage of. Time and experimentation will be needed to bring them out as educational tools which will help the individual hew to life's demands.

Fortunately, educators already are beginning to think along these lines, and it should not be a very difficult matter to come to the point where a wholehearted acceptance of these principles is but a matter of a very brief period of time. But it will be appreciated that in turn this means a very different approach to the whole subject matter than that which has been used in the past — not a particularly easy transition *unless the teacher and administrator* believe and even then the advance must be made rather slowly. Even if there will be a good deal of stumbling, nevertheless, progress will be made.

The newer social order is imposing an additional burden upon the schools because it must provide training for a citizenship different from that required of even the parents of the present generation.

The Needs of Youth

Youth is in turmoil. It is at sea, so to speak. Thinking demands are made upon the youth of today, far beyond those made upon the generation just grown up. And something must be done about it not only soon, but right now. The young of today need to *know* something of the working of the world in which they have been set. The "questions of the day" are so far reaching in their import, so far flung and withall so all embracing that they require a mental attitude which can only be obtained by a rigorous training and a wide experience covering nearly all fields of learning. Our present-day youth needs knowledge much more extended than of old. There may be differences of opinion as to the type, whether intensive in a few fields or broadened by contact with many, but the consensus of belief seems to favor the broader integrated type rather than the narrower concentrated one, unless the vocational attitude is already a definitely expressed one and even then this idea can no longer live in "splendid isolation," as is indicated by the search for enlightenment by the manual and other workers who have reached relative maturity.

In part, education has subscribed to this idea in connection with the curriculums of the junior high school where contact with a multiplicity of subjects on the "exploratory" basis is provided. However, unless the whole educational scheme is also integrated with the ideas just expressed as fundamental, it is likely to revert to the traditional and change the subject-matter content so that the junior high school will become merely a training for entrance to the senior high school. This is not a far-fetched idea but may be found in more communities than one, right now. So these ideas of integrated subject matter must become *idees fixe* if they are to function in the educational period of our youth.

Industrial Arts

The reader may wonder why no reference to the subject of industrial arts, using the term in its broadest sense, has been made so far. The writer feels that the foregoing general exposition is necessary to clarify thinking, and that it may not even be required to be very specific as to the subject or subjects involved.

As stated before, there are no special subjects as such; for if they contribute to the principles stated they are not special. They may, of course, be so considered if they are narrow in scope and poorly presented so that they do not contribute to general knowledge, but then they had better be left to some other time and not be used as educative but rather as *vocational* material. Maybe one is to call them "training" materials or subjects, but it is a mighty poor choice of material which *does not*, or rather *could not* be used educationally.

It may be questioned whether it is necessary to argue longer about industrial arts as integrated educational material in a generalized setup. Of course, it must be conceded that the subject is special and is used for training purposes primarily, then it is true, much needs to be said — on *this* side. But from present indications it may be taken for granted that more and more industrial-arts teachers see the need of treating the subject as a means to an educational end, and integrating it with the educational scheme or vice versa, for they realize that otherwise it will become a purely mechanical device for training or vocational purposes. It may be safely said that the industrial arts contribute, or at least may contribute to the artistic expression of the child; that it is an important integrating element in the study of mathematics; that it is an outlet for practical science and engineering; that it is a factor, and an important one, in a study of industrial relations; that it is part of the study of economics; that it plays a specific role in the study of geography and industry as a whole; that it is a contributing element in self-expression along the lines of avocations aside from its vocational aspect; that it represents a kaleidoscopic picture in the *study* of vocations and is a factor in guidance; that it also is an integrating subject in covering a large variety of skills per se; that it possesses elements which go to make for a better understanding of both the producer's and consumer's relations with society at large; that it is an important factor in the relationship of capital and industry; and that it is most important in fostering the imagination and in furnishing an outlet for the creative impulse. More might be added.

After all, the approach to the whole problem of integration will be determined by the philosophy in which one believes. The teacher who has none, will have to resort to the wasteful trial-and-error method. Even if the statements expressed in this article are not wholly accepted, nevertheless they may show the reader that a philosophy *is* a basic requirement before one can defend a position, whatever it may turn out to be.

The discussion outline of *Problems in Secondary Education,* published by the Department of Secondary School Principals of the N.E.A. under the caption of "Function I" contains the following: "To continue by a definite program, though in a diminishing degree, the integration of students. This should be on an increasingly intellectual level until the desired common knowledge, appreciations, ideals, attitudes and practices are firmly fixed."

It is necessary in each society that there should be a certain degree of sameness in backgrounds, experiences, purposes, ideals. In other words, it is necessary that a certain degree of integration be effected. It is a further fact, generally accepted, that the schools should take over a large part of the work of integration. There are certain facts, certain ideas, certain skills, which should be taught to all children, so that they may be able to work in society together and accomplish their common purpose.

EDUCATIONAL EFFICIENCY

The educational work carried on in the school cannot have maximum efficiency unless it is woven into a community life where all educational factors are being worked into a design for higher community living. The school may well be thought of as the hub around which much of the social and civic life of the neighborhood might turn.

—*Mark A. McCloskey,* Director, Bureau of Recreational and Community Activities, New York City.

Related-Subject Progress Cards

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Practical directions for planning and devising a usable and flexible system of related-subjects instructional cards.

Several years ago, the faculty of Murray Vocational School, Charleston, S. C., inaugurated a system of instruction on the "work-card" basis which completely revised courses of study, methods of teaching and marking, and report cards.

This system concretely improved the quality of education in our school. It eliminated "failures," counteracted the evil effects of inevitable individual differences, produced a higher quality of work, and raised the standards in every department of our school.

All subjects, including English, were put on the work-card basis. By "English" we mean "trade English" — the kind of English needed in vocational schools, not the "literary English" of the academic high school.

The English instructor in a vocational school knows that some things are of great intrinsic importance to his students; he also knows that other things, even though they may be taught in other schools, are of no real or practical value to his students. Then there are some things that are interesting but of doubtful value to the student. The first constructive steps, then, are to decide what things are most important to the student, and then make an outline of them. Then break up into smaller parts the large aims and objectives outlined, and make as many small objectives as possible. From these, select later the ones to be used. This subdivision takes much time and thought. It can be done only by a teacher completely sincere in his desire to give his students something concrete and practical to take with them into the business world after they leave school.

When the work has been divided into many small parts, prepare diagnostic tests, practice sheets, and final tests for these jobs. Much former material can be utilized with very few changes. A resourceful teacher can soon secure the new material which will be needed.

Examples from our cards will help here to illustrate breaking up a large objective into smaller parts. There will probably be an objective based on "business letters." Unless students need nothing more than a vague notion of the modern business letter, this title is too large for an objective. In our junior year, each student must write, without a book or other assistance, neat, clean, accurate, and reasonably good letters of the following types: Application, recommendation, ordering goods, sales, itemized bill, inquiry, collection, and friendly. Each is listed as a separate job on the card, and each student writes it again until he can actually write the letter decently without help — just as he would have to do in actual business life.

Written work of the *report* type is valuable. Decide first the subject on which the boys are to report; then give each report a name and put it down as a job. Reports such as these can be assigned: Book reports, shop job reports, movie comments, interviews with men in the boy's chosen field of work, reports on visits to industrial plants and to places of interest in the community, biographical reports of various kinds, reference reading reports, independent reading reports, reports on subjects assigned by the instructor, and the like. Each job named on the card sets up a definite piece of work which each boy must do.

Most students need practice in the use of capital letters; some need drills on only one use, others on different uses. Individual differences play a great part here, and the cards take care of these situations. Give each use a separate line on the card — make a *job* of it. Boys who do not need work on any specific job receive a punch for it and pass on; those who do need the work, keep on getting it until they finally learn to use the capital letters correctly.

In the same way, all the important parts of English can be subdivided so that each boy finds out what he knows and does not know. Good students eliminate their worst defects, consequently, their work improves steadily as they progress. They see this improvement and like it. Boys usually *don't like English* because it is too complicated, too mysterious, too much surrounded by teaching methods that repel them. When they see their English improvement, they lose their fear and hatred of it, and finally, they grow to like it.

An error that I made illustrates still further the subdividing of objectives. One job was originally: "Punctuate simple, compound, and complex sentences." At first this looked all right. Later I found that it should have been three separate jobs, for some boys need work only on the compound sentence, some need work on the simple and the complex, but not on the compound, while others need much work on all three. Because the job, as I originally laid it out, was not sufficiently definite and concise, I could not use it as effectively as I can now.

Mistakes like this are inevitable; they will not be noticed until the cards have been used for some time. Knowing that changes would be necessary, we mimeographed our cards, thus making changes possible whenever and wherever needed. In this way new ideas may be embodied readily and weak spots improved. Many difficulties will never arise if the subdivisions are made sufficiently numerous and clear cut.

Next, divide the jobs into three major classes:

1. Jobs adaptable to group instruction.
2. Jobs adaptable partly to group instruction and partly to individual instruction.
3. Jobs done without any instruction except directions printed on job sheets.

The samples shown are representative of work in each of these classes:

Subject-Verb Work. This simple title constitutes one of the hardest and most necessary jobs. It means whatever the instructor wants it to mean; to different students it means different things. It needs explanation and classwork, requires practice work, necessitates much drilling, testing, rechecking, additional work, and study, retesting — until results appear in written work. Results do appear after a while. This is a class-instruction job; each boy uses a printed sheet, does the work outlined, checks his own paper, and gets a *trial* punch for his work.

Later, working alone, each boy demonstrates his knowledge of subject-verb agreement. The results of this testing determine further work. Those who need no more work on this job get an *accomplished* punch and do no more work on it. Most boys, however, need more work, and they get it until each of them attains a satisfactory mastery of the job. To those boys who do good work on printed tests but do not use their knowledge in their own written work, the instructor explains that their careless errors must stop before the final punch can be earned. In almost every case, the errors gradually diminish and finally disappear entirely.

Total	Accomplishment	TRADE ENGLISH Card I
		Use of compound subjects
		Use of compound verbs
		Capital letters: In pronoun "I"
		In days and months
		In streets, cities, states
		In letterhead and salutation
		Addressing envelope correctly
		Placing return address properly
		Comma in salutation of friendly letter
		Intelligent definition of sentence
		Recognition of phrases
		Themes: First month
		Literature: First month
		Nouns in sentences
		Pronouns in sentences
		Verbs in sentences
		Tenses of verbs assigned
		Recognition of clauses
		Capital letters to start sentences
		Comma: In series
		With *yes* and *no*
		Plural forms of nouns
		Uses of apostrophe
		Use of -ED on verbs
		Letter ordering goods from catalogue
		Improves handwriting and neatness
		Themes: Second month
		Literature: Second month
		Uses of periods
		Uses of question marks
		Uses of *A, AN, AND*
		Spelling: Final-E rule
		Elimination of *demons*
		Class spelling work
		Forms letters of alphabet correctly
		Corrects errors in work
		Uses dictionary correctly
		Letter: Applying for vacation job
		Themes: Third month
		Literature: Third month

Total	Accomplishment	Card II
		Pronouns in sentences (II)
		Plural forms of letters and figures
		Plurals of verbs
		Similar forms of verbs given
		Comma in salutation and close of letters
		Comma with geographical addresses
		Period in abbreviations
		Uses of phrases
		Clear friendly letter
		Dictionary drills given
		Nouns in sentences (II)
		Verbs in sentences (II)
		Tenses of verbs given
		Uses of clauses
		Comma with nouns of address
		Capital letters: In quotations
		With N, E, S, W. (parts of U.S.)
		Comma-splice tests
		Plural forms of nouns
		Neat business letters assigned
		Themes: Second month
		Literature: Second month
		Verbs as keys of sentences
		Principal parts of verbs
		Adjectives in sentences
		Adverbs in sentences
		Period at end of sentence
		Subject-verb work
		Recognizes: Statements
		Commands
		Questions
		Spelling: Final-E rule
		Uses of apostrophe
		Elimination of *demons*
		Class spelling work
		Themes: Third month
		Literature: Third month.

Total	Accomplishment	Card III
		Use of prepositions in sentences
		Comparison of adjectives and adverbs
		Capital letters in titles of papers, etc.
		Comma in geographical addresses
		Recognition and use of linking verbs
		Define: Phrase, clause, case, tense, object, modifier, negative, antecedent, comparison
		Choosing correct stationery
		Making enclosures properly
		Themes: First month
		Literature: First month
		Use of adjectives in sentences
		Use of adverbs in sentences
		Punctuates: Simple sentences
		Compound sentences
		Complex sentences
		Comma-splice tests
		Comma in uses formerly studied
		Comma in quotations
		Comma with conjunctions *AND, BUT, FOR*
		Uses of apostrophe
		Adding *LY*
		Plural forms of nouns
		Letters assigned in class
		Correct form of business letter
		Dictionary drills given
		Themes: Second month
		Literature: Second month
		Prepositions with pronoun objects
		Review tests: Parts of speech
		Agreement of subject and verb
		Period at end of sentence
		Spelling *ING* words
		Doubling final consonants
		Class spelling work
		Independent reading reports
		Themes: Third month
		Literature: Third month

The second major class is a group of jobs of lesser importance, usually small items worth including, but not requiring a great deal of classwork. Introduce these by short diagnostic tests to discover how many need work on these jobs. Then give instruction to the group; record trial punches for this work. Some time later, retest these jobs. Those who seem to know the principles satisfactorily get *accomplished* punches; those needing more work continue until they master the jobs. Business letters furnish good examples of this type of job. Certain small but important uses of the comma make up another block of jobs in this division. Separate spelling rules belong in this group. *Want ads, ways of avoiding double negatives, comma-splice* drills, *grammar-review* drills — these are other types of work which can be handled in this way.

The third large group is made up of jobs done individually with no classwork. Literature and dictionary jobs are arranged

Total	Accomplishment	Card IV
		Adjectives and adverbs in sentences
		Ways of avoiding double negatives
		Difference: Past tense — past participle
		Capital letters: In titles
		In cities and states
		In abbreviated titles
		In organization names
		Paragraphing: Common types
		Use of topic sentence
		Themes: First month
		Literature: First month
		Correct cases: Personal pronouns
		Uses of prepositions in sentences
		Dictionary drills assigned
		Appositives in business letters
		Spelling: Study of *demons*
		Comma-splice tests
		Condensing material
		Themes: Second month
		Literature: Second month
		Principal parts of verbs given
		Review tests: Parts of speech
		Class spelling work
		Punctuate: Simple sentences
		Compound sentences
		Complex sentences
		Themes: Third month
		Literature: Third month

Total	Accomplishment	Card V
		Checks, notes, money orders
		Want-ads for help and work
		Avoid too many simple sentences
		Letters: Inquiry
		Recommendation
		Itemized bill
		Friendly
		Necessity of speaking well in life
		Importance of using good written English
		Subjects assigned in class
		Themes: First month
		Literature: First month
		Nominative-case uses
		Uses of main clauses
		Uses of appositives
		Capital letters: Important uses
		Comma-splice tests
		Using English to give clear directions
		Avoids too many compound sentences
		Letters: Ordering goods
		Sales
		Collection
		Application
		Independent reading reports
		Themes: Second month
		Literature: Second month
		Objective-case uses
		Uses of dependent clauses
		Punctuate: Simple sentences
		Compound sentences
		Complex sentences
		Avoids too many S-V-O sentences
		Reference reading reports
		Class spelling work
		Themes: Third month
		Literature: Third month

Total	Accomplishment	Card VI
		Biography of important man
		Movie comments on pictures seen
		Book reports assigned
		Shop reports on work done in shops
		Letters: Friendly
		Inquiry
		Itemized
		Recommendation
		What a Man Should Give to His Work
		Literature: First month
		Common abbreviations
		Dictionary drills assigned
		Interview with workingman
		Spelling: Study of *demons*
		ITS, IT'S
		THEIR, THERE, THEY'RE
		WHOSE, WHO'S
		YOUR, YOU'RE
		TO, TOO, TWO
		Shows interest in self-improvement
		Letters: Ordering goods
		Sales
		Collection
		Application
		What a Man Expects from Work
		Comma-splice tests
		Literature: Second month
		Grammar-review tests
		Class spelling work
		Punctuate: Simple sentences
		Compound sentences
		Complex sentences
		Corrects errors in all work
		What . . . Work Gives to the World
		Regular class themes given
		Literature: Third month

on job sheets, so that boys can do them whenever they feel like it or whenever these jobs fit into working time. Although a few of our themes are done with introductory classwork, most of them are worked in this way. Reports are individual jobs. These jobs are important because they give the instructor time to work with the students who need extra help, and because they tend to improve the reading, writing, and spelling abilities of the boys who complete them. The number and size of the jobs in this group are varied to suit the needs of each class, the instructor making changes as needed. This flexibility materially helps the instructor to stress those things which need the greatest time and attention.

Making work cards is simple after the outline of jobs, reports, objectives, and other work has been completed. At first the instructor cannot tell accurately exactly how much work can be handled by a class in any given period of time. This does not matter, however, if one disregards the outmoded theory that a boy can be "educated" in four years spent in school. Decide what each student is to learn, to know, to do. Then leave it up to him to complete his assigned work. When he completes each card, he is finished with it. Until he completes it, he gets no credit for his work. Most boys want to finish their cards and are willing to do the work required in order to do so.

In making the first card, decide what is to be done in the first term. These things, arranged in convenient groups, are typed out. Each line contains a separate job. The number of jobs assigned is determined by the instructor's ideas of what should be done in any given period. Make a card of each class, for each term.

When these tasks are done, start operating the system. Get a record book with large pages containing vertical lines. At the tops of the lines, write the names of

the jobs so that the book corresponds with the cards. Then start the work in class. Begin with the first major group of jobs, for the class will not feel the gradual shifting away from the old methods. As soon as the class starts working on practice sheets, individual differences will assert themselves. Some students finish ahead of others; these get jobs out of the third major group — the individual jobs. Within a week the system is in full swing, the leaders of the class are racing ahead of their group, the average students are proceeding at about the same general rate of speed, and the nonworkers and loafers are waking up to the realization that they must either get down to work or stagnate permanently.

Whenever a boy has satisfactorily completed a job, the instructor punches it in the *accomplished* column; the boy then goes on to another job. The amount of work required for an *accomplished* punch depends upon the boy's demonstrated ability and his instructor's standards. Consequently permanent, practical learning is assured.

The entire course of study can be typed, front and back, on two cards. These are kept by the instructor and used in class to show at a glance what each student has done and still has to do. Additional material can be added at any time, or taken off if too much work has at first been included. A year of experimentation with the cards will show what changes are needed. These can be made during the summer and typed or mimeographed on new cards for the new term. Whenever the instructor feels that his cards are satisfactory, he can have them printed in quantity for future use.

Today's Shifters, Tomorrow's Shirkers

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The answers to the problems which confront those who are entrusted with vocational-guidance responsibilities are not found at the end of the book.

With uncomfortable and disquieting complacency, we have come to accept and take for granted the common spectacle of the occupational misfit as a necessary evil of an imperfect universe. However, it must be added that the choice of a right vocation is no easy one. With a complex civilization has come a bewildering subdivision of occupations as well as a host of new ones until we now have the grand total of 20,000 different categories of work. If we were to change positions or kinds of work every day including Sunday from the day that we were born, it would take us about 55 years to sample every variety of human labor. The kinds of work that man has devised and in which he engages are as diverse as can possibly be imagined.

With equal nonchalance and dignity man may be an offal striker (a person who passes leather made from the bellies and shoulders of hides into a machine for smoothing out wrinkles) or a maker of wedding rings or a maker of tombstones. If each job called for different qualifications, it is obviously impossible for any one individual to possess or to become even nearly familiar or acquainted with the unique requirements of each job. It is no wonder then that so much confusion and doubt reigns as to what vocation to enter and that so much maladjustment is extant.

Is this vocational disharmony a condition that affects only the immature, the young, the uneducated? Is the grit in our industrial machine the result of the choice of unsophisticated minds? Do maladjustments arise because of insufficient opportunity to know one's mind, one's abilities, and the opportunities that call from the world without? Would we reasonably expect our high-school people to make wiser vocational choices than those in grammar school? Do our college graduates and those in colleges make still wiser choices? Do they represent the minimum in labor turnover? May we expect that the cumulative effect of advancing years and academic education will exercise a mellowing influence and temper one's occupational enthusiasms? Let us see.

Elementary-School Graduates' Choice of Occupations

A study of 2,709 elementary-school children in 1933 revealed that 77 per cent of the boys had chosen occupations which they had no chance to enter. Only 40 per cent of them had any sort of factual knowledge of their *chosen* work. Imagine! More than three quarters of them were pounding their heads against an occupational wall that was relentless and unyielding. About two thirds of them didn't have the least conception of the nature of the work they had chosen. Moreover, it was found that at least one third of them could give absolutely no reason why they had selected the particular work that they did.

In 1935 a study of the occupational choices of some 10,000 school boys between the ages of 9 and 18 showed practically no relation between the number of boys selecting each vocation and the number of workers then engaged in the 138 occupations listed. In other words, an occupation in which the chances of employment were very good would be no more effective in attracting our young workers than that in which there was practically no chance to gain a foothold. Again the picture of hopes and aspirations lying crushed and defeated at the foot of the wall of stern reality. It was found that most of the boys that were studied expected to enter occupations which were already overcrowded and seemed to avoid those occupations which included fewer workers but which appeared to be lacking in prestige or in remuneration offered. One can only guess at the vocational mortality resulting from the luring mirage of prestige and remuneration.

The average child leaving the elementary school today has but a smattering of knowledge of himself and still less of a smattering of acquaintance with a few occupations in the world about him. He may know whether he is particularly inept in the use of the spoken or written word, whether he can use numbers as tools, or whether he has a particular facility with his hands that allows him to tinker efficiently with all sorts of mechanical gadgets. In a similar fashion, he knows rather vaguely that the average carpenter must know how to handle a saw, how to nail two boards together and how to plane a surface smoothly. Perhaps many times he has seen the grocer or the shoemaker

at work, and in a somewhat undefined way he can relate the general scope of duties of each. Beyond that the average elementary-school graduate knows nothing about himself or about occupations. Is it small wonder that they clutter up the ranks of the unemployed? It is indeed unfortunate that they usually have very little to offer a prospective employer. It is still more unfortunate that they scarcely know what they have to offer and thus are unaware to whom to offer most appropriately their limited skills. Indiscriminately they bestow them upon all.

High-School Graduates Choose Occupations

As we pass from the elementary-school to the high-school level, we find the same picture of vocational floundering bringing with it many deep-seated feelings of failure and uselessness. Adolescence, the decade between 15 and 25, is usually the period in an individual's life when he begins to think very seriously of the choice of his lifework. If one has not made, by the age of 25, any kind of beginning toward a satisfactory vocational adjustment the chances are against his ever finding or succeeding in any satisfactory occupation. He is more than likely to become one of our garden variety of vocational weeds, springing up everywhere and wanted nowhere.

From a study of adolescents, it has been found that their vocational interests are relatively unstable and impermanent and certainly of little, if any, significance by themselves for predictive purposes. Moreover interests and aptitudes are much less commonly associated than supposed. Unfortunately, a desire to be a musician is not always predicated upon a musical ear. An overpowering passion for the physician's life may not necessarily be a companion to the requisite qualifications for training in medicine. Much has been written about individuals being forced into particular jobs by the necessity of a harsh fate or by the stern demands of a domineering father. But how many more have been the cruel victims of an impractical and illogical fancy? It has been found, for instance, that about 81 per cent of our senior-high-school students give as their reason for their particular vocational choice, interest or liking for the occupation chosen, whereas only about 1 per cent can boast of actual experience in the work. Just think, 80 out of every 100 high-school seniors like something that they haven't had the slightest experience with, and we all know that true interest or liking for a work can only be gained by actual experience in it. Furthermore, it has been found in the majority of boys between 14 and 17 that whatever their vocational interests may be, when they do go to work, their first job is usually not based on any judgment of suitability but is almost entirely a matter of opportunity and convenience. The exigencies of fate seem in most cases to overthrow the careful calculations and plans of our ambitious youngsters.

Parents very often superimpose their own wishes and thwarted desires upon the occupational choices of their children. Visions of social prestige and lucrative returns on their financial investments in their offspring's education as well as a host of other more or less selfish and vain ambitions are powerful forces that distort many hopes of vocational adjustment. Usually the modern parent urges on his son the money argument to persuade him to enter the profession whether he be fitted or not, while on their daughters the arguments of fitness and social contacts may be used to get her to see the wisdom of working in an office where *nice people* may be met. However, it must be said that modern youth is rebelling against "following father's footsteps" just for the sake of tradition alone. A recent study of a group of boys of high-school age revealed the fact that over three quarters of them chose vocations other than that of their parents.

It has already been mentioned, that there are about 20,000 known occupations and theoretically, at least, the skills and knowledges demanded by each one may be slightly or greatly different from any other depending upon the functional relationship or classification of these occupations. We know that no two individuals are alike. Again, theoretically, we might expect that with such a great diversity among individuals and among occupations, the range of occupations selected even by the members of a single high school might be rather great. Yet such is not the case. A study of high-school seniors in a given community over the period from 1929 to 1933 showed that choices were concentrated in a few traditional categories despite the fact that such concentration did not agree at all with known facts about corresponding abilities, interests, and opportunities. This narrowing of vocational choices to a comparatively few occupations is strikingly brought out by a recent study of three high schools. More than 75 per cent of the total student body chose their lifework from among only eight occupations! Another study made in 1935 of 4,543 high-school boys revealed that 70 per cent of the boys wanted to engage in work represented by only 35 per cent of the then gainfully employed population as shown by census figures. The wonder of it all is that we have really so few occupational misfits. Many more would be expected by this disastrous herd conformity to pattern without regard for individual differences in abilities, economic opportunities, particular industrial demands, and so forth.

Unpredictableness of Vocational Choices

Presumably this narrow range of occupations chosen may have some relation to their prestige in the scheme of things. But we may very well ask whether or not the depression has changed all this. Are not certain occupations, heavily charged with so-called social prestige, such as banker or stock broker, on the wane? Are not others, such as social worker or recreational director, on the upgrade insofar as their social status is concerned? To answer these questions, a study was made in 1928, 1932, and 1934 of the rankings in social status of 40 occupations and professions by a total of 1,622 high-school seniors in various communities. A previous study made in 1925 provided comparable data. The results revealed the rather startling fact that in the ten-year period (1925–1935) practically no changes had occurred among the highest ten or among the lowest ten occupations. In the opinions of these students, the banker in 1934 still held first place in social status and the second to tenth ranks still remained occupied by the professions. Stocks may rise and stocks may fall, the country may topple from the gold standard, people may grow rich on the fat of the land or they may starve on the streets, but it is still the banker's profession that high-school seniors look to with longing eyes!

This picture of uncertainty of vocational choice, lack of practical considerations in making a choice, injudicious appraisal of one's abilities in relation to occupational demands are forces that motivate high-school students in selecting their lifework is rather discouraging. Can we blame their confusion, doubt, and lack of clarity in planning upon their relative youth and lack of sophistication? Do greater vision and awareness of one's capacities, deeply-rooted interests and needs as well as a keener insight into the modern industrial picture come with college years? To answer this question a study of freshman classes was made several years ago. It was found that one third of the average freshman class in college had not yet decided upon a life career, and one half of the others, who apparently had made some sort of vocational choice, changed their minds before they reached the senior year. In other words, indecision characterizes our college population also. There is little guarantee, moreover, that even the one third of our

(Continued on page 18)

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

J. J. Metz, Editor

Mathematics and Industrial Arts

It is quite the common thing to hear parents and even educators speak about the futility of making it compulsory for high-school students to study algebra, geometry, trigonometry, and the like. It is true, there are many adults going through this world who have had but little need for some of the mathematics they were required to study during their school life. This may even be said of the arithmetic taught in the elementary school. A very large percentage of people, either by choice or otherwise, seem to get along very well with but a very meager knowledge of the fundamentals of arithmetic.

Industrial-arts work requires accuracy in most cases and this, of necessity, breeds the need for mathematically calculated quantities. Some may retort that even such craftsmen as machinists who work to exceedingly fine dimensions do not need to know how to make calculations down to thousandths and ten thousandths of an inch. During the year preceding our entry into the regrettable world war, many men who had never been trained as machinists, and who had but a hazy conception of how accurately they wrought, maintained very fine limits of accuracy in the production of machine parts, hand grenades, and the like, in the munitions factories of the country. This was made possible by the use of many types of gauges, and the fact that this accurate type of work was possible with untrained workers may have given many the notion that there was little to the machinist's trade.

Then, too, the contention may be made that draftsmen and designers are the only ones who need to know how to make all of the fine calculations needed for the accurate work now commonly achieved in manufacturing the many different types of machines, appliances, structures, and the like, with which we come in daily contact. This is partly true, because it is commonly accepted in industry, that shop drawings should be so made that the mechanic need not make any calculations. If, then, the artisan works from drawings, one might conclude there is no real reason why he should know arithmetic or any of the higher mathematical branches.

A study of industry will soon prove, however, that a mechanic who knows little about mathematics occupies a very precarious position. Machinists, electricians, printers, men in the building trades, auto mechanics, and those in the various fields of transportation, find that as they advance in their different trades, there are increasingly more opportunities offered in which a knowledge of mathematics is a necessity, or at least a great help, and that in many cases such knowledge is really necessary for further advancement.

Teachers of industrial arts and vocational education in the main, realize the value of a workable knowledge of arithmetic, algebra, geometry, and trigonometry. In their guidance work with the boys who come to their classes, they can do much good in counseling students not to throw away lightly the opportunity to take up the study of mathematics as is offered in high school. It is well to call the students' attention to the fact, that while the work of acquiring mathematics in school may be difficult, that same difficulty will be encountered in studying the subject later on in life. To convince the ambitious boy that he needs mathematics, the teacher need but direct him to the trade handbooks on the shelves of the school-shop library, and point out to him that most of them contain mathematical formulas, hints for making calculations, constants required in figuring lengths, areas, volumes, weights, angular measurements, thermometric variations, and the like, which the earnest student may not overlook if he wants to advance in any of the practical trades.

The need for mathematics in industrial arts and vocational education also points out the ease with which these subjects may be integrated, and this phase should not be overlooked by the shop teacher who wants to make his work function in the training for life which he is endeavoring to give to his students. As a matter of fact, the present trend toward integration points out a very good reason why the shop teacher should be an ardent advocate in the endeavor to have more boys choose mathematics as one of their studies in high school.

Printing Instructors Show The Way

Alert shop teachers are always looking about for suggestions on how to improve their work. These teachers will be glad to learn what their brethren in the fields of printing instruction are doing to improve their contribution to the education and training of American youth.

Many of the most outstanding printing instructors belong to the National Arts Education Guild. The members of this energetic professional group some years ago conceived the idea of organizing student printers' clubs on a national basis. Accordingly they started The National Student Graphic Arts Society in 1935 and it quickly grew to a lively organization of 35 clubs. During 1936–37, this number was increased to 53 clubs, all interestedly working and vying with one another. New clubs are continually being added and interest in this venture is running high in all states of the Union.

The constitution for this national organization states the objectives for which it was formed as follows:

1. To unite students and instructors in graphic-arts fields for mutual educational benefits.
2. To emphasize particularly the cultural and practical aspects of graphic-arts education.
3. To conduct regular projects and to award appropriate recognition for outstanding pupil achievements.
4. To stimulate pupils to appreciate and to use the several methods of graphic duplication for personal pleasure and social betterment.
5. To promote printing and allied processes as handicraft or manual-arts hobbies.
6. To encourage schools to improve their printing courses for educational purposes instead of using the printing department merely as a mechanical convenience.
7. To encourage a wholesome, frank, personal relationship between students and instructors, and to relate this spirit of comradeship to community life.
8. To promote pupil activity and leadership "on his own."
9. To get the pupil's viewpoint and to work with him, instead of on him.
10. To conduct a systematic exchange of ideas between clubs and graphic-arts instructors.

PUBLIC LIBRARY DETROIT, MICH.

Every one of these objectives emphasizes a point fraught with meaning for both student and teacher. Every one of them can be readily adapted to other shop subjects. A vital point to remember is that club membership is not promiscuously conferred on the student body. A club should represent a select group of boys regularly enrolled in a given course, and the membership should be restricted to only those who are doing good work and have the right attitudes toward their work. In this way, club membership is something to be earned by the student. He looks upon it as a privilege to be chosen as worthy of such membership. The club, therefore, acts as an incentive to all to do a better type of work.

Another feature introduced by this national organization is the offering of prize awards for outstanding work. At the 16th Annual Printing Conference held in Chicago June 28 to July 1, 1937, there was an exhibit of scrapbooks on printing. These had been prepared by members of The National Student Graphic Arts Society and represented work on the trade level, senior-high (nontechnical) level, and the junior-high level. All of the work exhibited was of a uniformly high grade.

Another forward step made by the National Graphic Arts Education Guild is the promotion of *The Club Crafter,* an eight-page monthly, whereby the members of The National Student Graphic Arts Society can make the mottoes "Share your knowledge" and "Exchange your experiences" an easily realized aim.

Teachers of industrial arts and vocational education will do well, therefore, to study carefully what the teachers of printing have accomplished with this student-club activity. It is bearing fruit for them — it has equal possibilities for others.

Innovation and The Shop Teacher

Shop teachers, on the whole, cannot be accused of being afraid of trying out new ideas. Many of them are exceedingly versatile, ambitious, and clever in working out novel procedures and new application of materials. No doubt, if shop teachers did more publicizing of their activities, their reputation for progressiveness in this regard would compare quite favorably with that possessed by other professions.

On the whole, however, man is too prone to be satisfied with the *status quo*. Most people will blindly follow that which has been done before, and shop teachers are no exception.

It is said that when Benjamin West painted his "Death of General Wolfe," his insistence on picturing the battle scene as it actually appeared, precipitated a veritable war in the artistic world. Up to that time, scenes of the type he had set out to paint were always depicted in the classical manner, that is, the characters were pictured in the dress of the Greeks or the Romans. So bitter was the fight that even the king for whom the picture was made, refused to accept it.

Those who view West's masterpiece today, would, no doubt, think that something must have been seriously wrong had West not insisted upon having his way when he retorted to his advisers and critics, "I will not have my Frenchmen running about half clad, or General Wolfe dying in a Roman toga."

Teachers, too, at one time were students. It is but natural for them to teach as they were taught. If real advancement in education is to be made, however, every instructor must carefully scrutinize not only his subject, but his teaching procedure. Probably such a study might disclose practices as archaic, formal, and inflexible as the art from which West divorced himself.

So frequently, when any change is proposed, the innovator is ridiculed and derided. Then, only after the worth of the new departure has been fully demonstrated, is it accepted, and finally it becomes, in turn, the tried and true method. After this has happened, it is human fashion to laud to the skies, the new, which previously had been derided, and to denounce the old which formerly had been held to be almost sacred.

Shop teachers, as well as other teachers, must forever approach their work with open minds and a scientific attitude. The teaching methods that are being used by the individual today may be satisfactory and good, yet they may not answer all of the requirements next year. This may not, and usually does not, mean that all of the plans of the past must be discarded. Frequently a slight shifting of emphasis may be all that is required. In the advancement of learning, however, this innovation should be made.

Frequently one hears of teachers who are using the same outline of instruction, the same instructional material, the same projects, year after year. Surely these instructors do not know what progress means. They evidently have not been on the alert to improve themselves or the material which they are offering to their students.

On the other hand, there are instructors who make innovations so frequently that it seems as if they were obsessed with the idea that change in itself constitutes progress. This, however, need not necessarily be true. There must be a reason for the change. The innovation must be based on a need. It must be in the form of a well-thought-out solution to a problem. Not to do something different, but rather to do better that which has been done before, must be the reason for changing that which education is offering to our youth.

It is only when innovation has been preceded, inaugurated, followed through, and tested by sane, thoughtful, and impersonal study that it can do the good which is expected of it, and it is only this type of innovation which can ultimately improve what is now being offered in the field of industrial arts and vocational education.

Nonconstructive Criticism

At a recent educational convention, a representative of labor quite bluntly charged that graduates of vocational schools were exploited by industry, that they were often kept too long as apprentices and as low-wage laborers.

Charges of this type are so general that their truth is difficult to trace. If such things have happened, how can future recurrences be avoided? The public school in America, from the elementary level up to the university, is and must be the servant of all the people. It may not unduly favor industry and business against labor, but it may not do the opposite either.

Apprenticeship as it is carried out in Wisconsin, and as it is planned in a national way by the Federal Committee on Apprenticeship Training, would plainly obviate such exploitation of apprentices as charged.

General charges, now constructively made, do not solve the problem of furnishing adequate training for all of our people, and labor, business, and industry must work together constructively to make education, and that also includes vocational education, effective for the youth of our country.

(Continued from page 13)

college students who are unwavering in their choices from the freshman year onward, have made selections based on true understanding of the problem, since the majority have little or no information about themselves, about vocations in general, or their chosen work in particular. The latter ignorance becomes quite evident when we consider the results of a recent survey of the opinions of college students in reference to the average incomes of the workers in their prospective occupations. In general, college students have fabulous notions of their probable incomes. It was found, for instance, that students anticipating teaching, medicine, law, or dentistry as a career believed that they would earn four times as much as the average worker in the profession actually earns!

College Students Choose Occupations

Another study that makes us pause and wonder as to the social value of a liberal education is one performed in 1935 in which 673 college students were asked to indicate their attitudes toward 25 occupational groups by ranking them on the basis of social contribution, social prestige, and economic return. It was found that rankings on social prestige were more clearly associated with economic return than was either of these with social contribution. Apparently the average student believes that acquisition of social prestige and influence is more likely to go concomitantly with a large income than with any unselfish devotion to the commonweal. The philosophy of our society that has ennobled our moneyed classes is reflected in these student opinions. These selfish attitudes are largely carried over from school to industry. A study of 1,700 employed adults in commercial and professional pursuits indicated that the desire to serve motivated only 3 per cent of them in selecting the particular vocations that they did.

It is quite evident that in a great majority of cases college graduates are often influenced in their vocational choices by relatively unimportant considerations. These choices are founded too frequently on rather superficial or incomplete views of the occupations. How inconstant these choices are, even in the case of college graduates face to face with a workaday world and with the stern realities of self-support, is revealed by an investigation of a class of college graduates in 1930 and of these same individuals again in 1935. One half of these graduates had changed their occupations for which they had spent years of study and training within five years after graduation. This figure of 50 per cent is quite a conservative one to judge from similar studies at other schools. In 1925 a study made at a large engineering school uncovered the amazing fact that 65 per cent of their graduates were not engaged in engineering five years after graduation. These figures assume particular importance when we realize that training for the engineering profession is usually so specialized and technical that it is hardly adaptable to some other calling. Furthermore, the year of the investigation, 1925, was a relatively normal year and hence the figures are not exaggerated by the influence of lack of placement opportunities so often associated with depression years.

Formerly the jack-of-all-trades-and-master-of-none was too commonly the individual who left elementary school, with or without benefit of graduation, to look for work. True, he was untrained and relatively uneducated and most of us accepted his constant vocational readjustments as a normal consequence of such lack of knowledge and skills. Apparently the remedy does not lie in stuffing more academic learning down eager throats without adequate correlation of abilities and needs. Today we have the all-too-common tragedy in our midst of the liberal-arts graduate who doesn't know what to do. These individuals with newly acquired diplomas and college-paid sophistication are usually without any special interests or proficiencies, without any knowledge of the ways to get a job, not just any job but the particular job that best fits each individual, in most cases without even a set of industrious work habits. They file innumerable applications for every job under the sun, drive personnel managers frantic, fill our employment agencies daily with monotonous regularity, and throng the streets of the agency centers in the larger cities. The majority of these individuals are searching vainly but with romantic enthusiasm and visionary impracticalness for that one job which they must find in order to achieve their perfect happiness.

A Desk Set in Copper—IV

Leon H. Baxter

Association for Crippled and Disabled, Cleveland, Ohio

The fourth of a series on an interesting art-metal project.

The letter holder presents some difficulties as the separate pieces have to be cut to exactly the same length, and the back and front must be similarly designed. All pieces are of 18-gauge copper, the back being 5¼ by 6 in., and the front 4 by 6 in.

Lay out the outline of both pieces according to the dimensions shown on Plate

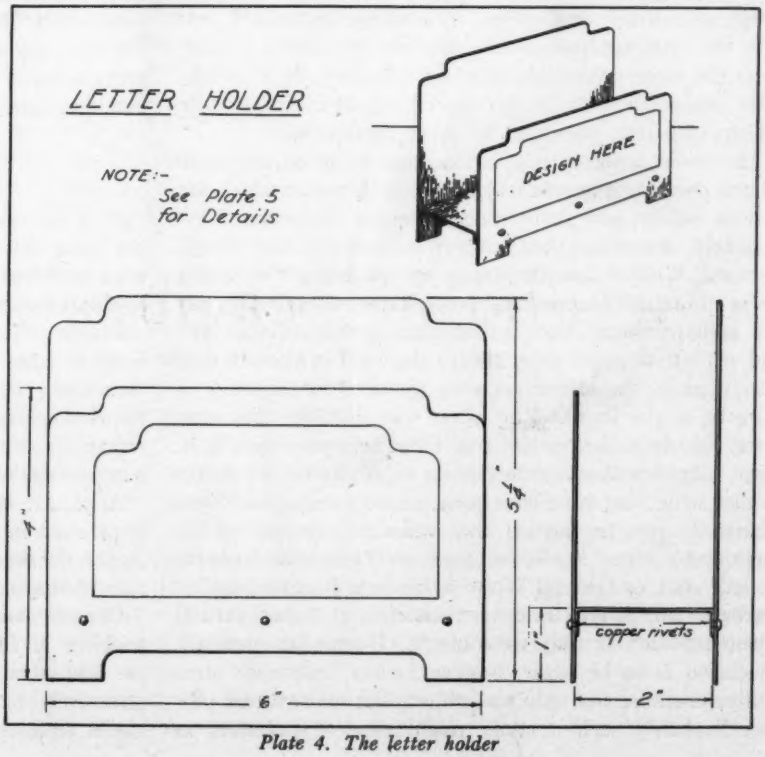

Plate 4. The letter holder

5, sawing carefully to the line and rounding off the corners.

Cut the bottom piece 2¾ by 8 in. and draw lines ⅜ in. from, and parallel to, the long edges. This will be bent later by the method shown in Figure 11.*

Draw the deer design by the square method and glue the design to a piece of 20-gauge brass and saw to the line. File and finish with fine emery cloth and steel wool. Outline the border on the front with the dapping tool. See Figure 9.*

After the holder is assembled clean contact joints where the design is to be placed and also the underside of the design itself. Apply flux and bits of solder (see Figure 4, page 284, September, 1937, issue) and solder in place. Clean in pickle of nitric

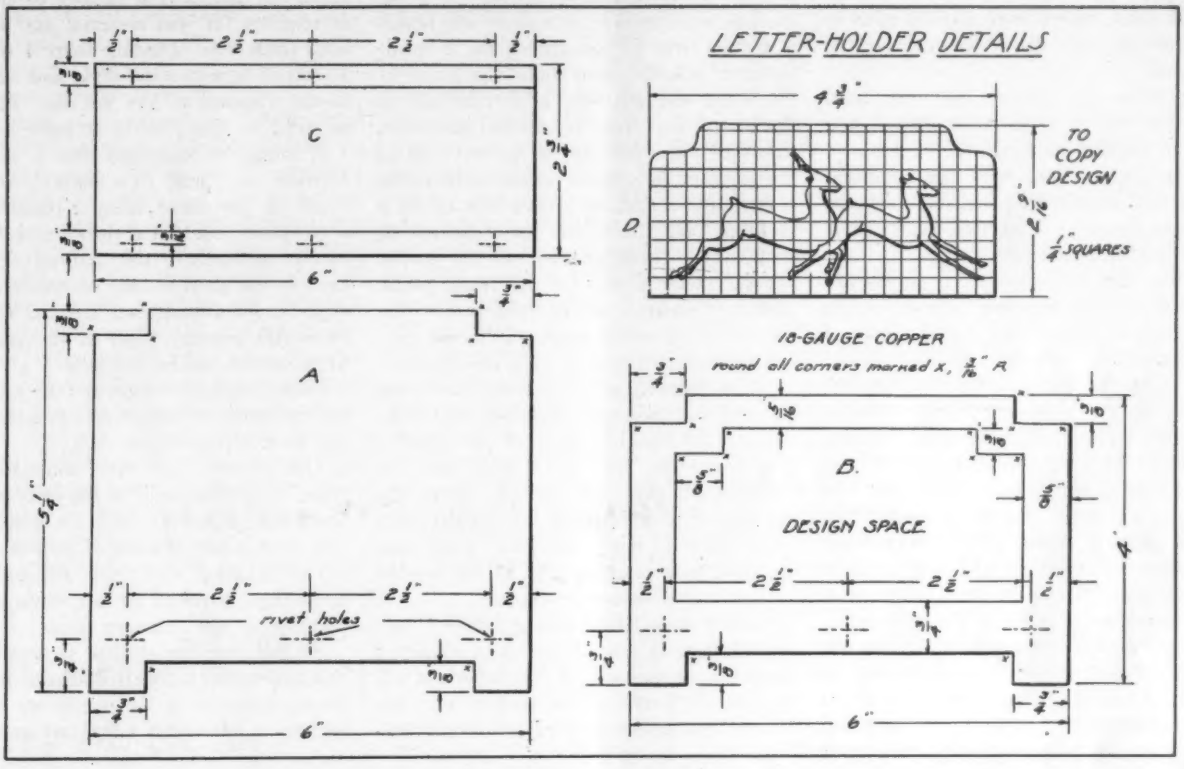

Plate 5. Letter-holder details

Lay out all rivet holes on the three pieces, being very sure that they coincide, and drill the holes slightly larger than the rivets to be used. Planish the exposed parts of the back and bottom pieces by method shown in Figure 10,* with the exception of the outline space enclosing the design.

If all pieces are now complete, cut six rivets slightly longer than twice the thickness of the metal, and rivet the pieces together as described in the making of the Desk Calendar and as shown in Figure 12, page 286, September, 1937, issue of this magazine.

*Page 285, September, 1937, issue of this magazine.

acid and water as described previously and place in the fuming jar. Remove at the end of 10 or 12 hours, and clean the design with fine emery paper and steel wool and lightly go over all of the letter holder with fine steel wool to bring out the high lights. Brush and apply wax and polish.

A Method of Teaching Printing

Dean W. Conner

Connelley Vocational High School, Pittsburgh, Pennsylvania

How one printing instructor takes care of some of the difficulties that arise in his work.

Perhaps the only advantage in learning printing in a trade school over serving an apprenticeship in a commercial plant, is that in some schools the instruction is arranged in a systematic teaching order, and consideration has been given to the arrangement of learning difficulty rather than entirely shop routine. This not only holds true from the learning standpoint but also from the teaching standpoint as well.

For many years the teaching of reading in the public schools was seriously retarded on account of antiquated methods of teaching. Since new methods have been developed, and consideration given to the way pupils learn and not the way reading is done, rapid strides have been made, proving that the new systematic way of learning is far better than the old hit-and-miss method. Instead of learning the alphabet first, then learning parts of words, and finally entire words and sentences, with the hope that the student will some day be able to put them together, the pupil now is taught to recognize sentences and words right from the start.

Since printing has been a part of the public-school curriculum, teachers of printing have been making mistakes similar to those made in the teaching of reading. It is with this in mind that the writer is presenting this method of teaching printing.

Being well aware that in most school printshops a certain amount of production is required, and that in some school

districts the teacher of printing is judged entirely by the amount of work he produces and not by the number of good printers he trains, something must be done to remedy these conditions. In very few instances do the production and instruction go well together, therefore, some attempt must be made to handle both in a manner that will be convenient for the instructor.

The following scheme has been tried out in one of the large trade schools and found to be very satisfactory.

All production jobs with the exception of type distribution are given to pupils who have completed at least two years (four semesters) of instruction.

During the first semester, pupils are taught the lay of the case, how to handle type, how to space and justify lines of type, to set the various indentions, initial letters, tying up forms and such other operations as are necessary to set straight matter with a certain degree of proficiency. One fifth of the first-semester pupils take press feeding at some time during the semester. Up until the beginning of the second semester, there is no change that instructors of printing are not already familiar with.

The teaching of job and display composition has always been difficult to handle; therefore, the writer has developed a method of teaching this part of the work. The second-semester pupils are divided into five groups, one group taking bindery work and the other groups rotating throughout the semester.

Instead of giving the pupil jobs to set up which either require considerable time to explain and demonstrate, or necessitate a job sheet so long and complicated that the instructor himself has difficulty in understanding, a job that is already set as nearly perfect mechanically as possible, is given to him. A proof is taken and the various styles and sizes of type marked. These may be found on a style sheet of the various styles and sizes of type in the shop. Right here the student learns to recognize the various styles and sizes of type without any assistance from the instructor. He is permitted to mark his proof with location of materials used in the job. After the proof has been examined and O.K.'d by the instructor, the student obtains a sufficient number of blank cases for the various styles and sizes of type, labels them, and proceeds to distribute his type into these blank cases. When he has the type distributed and all materials arranged in a systematic order, he again calls on the instructor to examine them, after which he resets the job exactly the same as it was when he received it.

It is the belief of the writer that a good example, in the way of a nearly perfect job set before the student, will do much to establish habits of correct typesetting and the putting together of jobs, than a hundred attempts to set jobs that the student knows nothing about. When the job is reset, proofed and corrected, the proof marked with the student's name and bench is turned over to the stoneman, a third-semester student, who locks the form. If the form will not lift, it is returned to the compositor. It is very seldom that more than one form ever has to be returned as the worth-while student wants to show the older student that he knows how to set a job that will lift. If the job locks up all right, it is then returned to its proper storage place ready for the next pupil. These jobs are varied in order to give the student an all-round experience in the various operations required of a compositor.

Third-semester students spend their time on book composition, imposition and lock-up, and the distribution of all job and display type that has to be distributed in the shop. If the cases become mixed, the distributor is required to thoroughly clean such cases as need attention. They also set such new practice jobs as are needed for the second-semester students.

Having these jobs standing makes it easy for the student when it comes to obtaining materials, as they are all present in the job. It does not handicap the student who has to wait for materials, therefore, a comparative grade can be given each student for the same job. Average time for doing the job can be established thus making it possible to set a satisfactory rating scheme. The student sees how the job is actually put together, which after all is one of the most important mechanical details of printing. It requires far less material and type to keep these jobs standing than it would if a case of type of each style and size were at the disposal of the student. This way all type in the jobs is actually working.

It might be suggested that if one were desirous of trying this method, the jobs could be purchased from a trade composition plant and that styles of type be kept to few in number, and that sort cases be kept in the shop in case of accident, or if type becomes worn and broken. This will leave the foundry type in the shop free to be used on production jobs.

Fourth-semester students take presswork for the entire semester and practically all the work is production.

The student has now completed two years (four semesters) in the printshop and from his experience will be able to set jobs with a fair amount of skill and put a job on the press, feed press, and do bindery operations required of an advanced apprentice in the ordinary shop.

At this time the student is permitted to choose whether he will remain in the composing room or in the pressroom until he secures a job as an advanced apprentice.

Lessons for Young Workers—II

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The second of a series of suggestive lessons designed to help students of industrial arts and vocational education.

Is the White-Collar Job Necessary?

Although each of us must work if he is to do his share in producing the things that he wants in this world, it is not to be supposed that each must do the same kind of work. If you look around you will see that in the satisfaction of our wants, two types of labor are in use:

1. *Physical labor,* in which muscular effort is the chief thing.

2. *Mental labor,* which engages the faculties of the mind.

The first of these only moves things, although even the ditch digger must exercise his mind to some extent in order to handle his shovel with judgment and skill. Again, it might be said that physical labor is *effective* in proportion as it is directed by intelligent mind.

Mental labor manifests itself in at least three different ways:

1. In discovering what materials can be used under certain conditions, and how they must be treated.

2. In inventing ways and means of handling the materials most efficiently.

3. In superintendence.

It is possible that you do not agree with these statements because you are convinced that the fellows who move around the plant with white collars on are unnecessary in the production of the article you help to produce. They never seem to do anything, and they seem to have time to stand around when your piece rate compels you to hustle continuously if you want to earn a reasonable wage.

Did you ever consider what would happen if all these fellows with the white

collars were suddenly fired? You boys and men who feel that you do all the work could then do as you please. Suppose for a moment that you were allowed to do as you please. Would you all work? If you did decide to work would not each of you be trying to get the easiest or the cleanest jobs? And if you happened to be a little fellow, would not some of the bigger boys beat you if you did not surrender the pleasanter jobs to them?

Suppose you agreed to work, and agreed also on what each one should do, to whom would you appeal if something went wrong? Wouldn't you have to appoint someone as head? Again, who would check up your time? Who would make up your pay envelope? Who would write the letters? Who would purchase the materials you use? Who would sell the goods you produce? Who would make sure that the firm you were selling your goods to would pay for them in order that you might be sure of your pay? Would you not have to appoint people to do these things, and would it be necessary for them to get as dirty doing them as you get in the foundry or on a screw machine?

It is true these people you appointed would not get dirty, it is true also that they do not exert their muscles as you have to do, but will you not agree that what they do has to be done by someone? If they are doing something that is necessary to the production of the articles made in your factory, does it matter whether they wear a white collar or a black shirt?

This question of each one doing his share in the work of the world can be carried outside of the factory. The mother in the home is doing her part when she nurses and rears the men and women of the future; the teacher in the school develops the minds of the future citizens; the preacher meets the demands of people for inspiration and guidance in spiritual matters, and the legislators fulfill a need for the establishment of law and order in the country. This kind of labor does nothing directly to increase the production of goods, but one cannot conceive of a progressive community without mothers, teachers, preachers, and legislators. They provide something which men want, and are, therefore, contributing their share toward the satisfaction of human wants.

The principal points to be considered in this lesson are:

1. There are two kinds of labor — physical and mental.
2. The first becomes effective in proportion as it is intelligently directed by the second.
3. People who are not actually working in a store or factory may be doing their share of the work of the world.
4. The fact that a man wears a white collar does not indicate that his work is unnecessary.

Questions for Discussion

1. Does your superintendent do any work?
2. Does the foreman work as many hours each day as you do?
3. If the superintendent and foreman do work, how is it that they have time to stand around and talk with one another.
4. Would you say that a locomotive engineer works when all he has to do is to start his engine at one station and stop it at the next, which may be 70 miles away?
5. Does the girl at the telephone switchboard in the office do as much work as the man who lifts heavy castings in the foundry?
6. Is it possible that some persons work because they love their work?

General-Shop Safety Instructions

Harry M. Dexter

Central High School,
Grand Rapids, Michigan

How one teacher of metalworking prepares his students to do dangerous work with safety.

Every teacher ought to adopt the slogan, "I am to return the boy to his parents, in a better condition, physically and mentally, than he was submitted to me." For this reason, safety instructions must be continually emphasized, especially in the metal shop.

The writer has made it a practice to devote at least one hour for safety instruction for each class at the beginning of each semester. Safety instructions may not end with those given the first hour, however, but are to be taken up briefly at every succeeding shop period, in order to emphasize and re-emphasize the most important items on safety. It is well to call the students' attention to the dangers that are constantly lurking about us while we are at work. Of course, we do not have to remind pupils not to stick their fingers into melted lead because it will hurt, but it will be worth while to emphasize that it is very dangerous to go near melted metals with wet hands, clothes, or tools, for if one small drop of water falls into melted metal, there will be an explosion and faces, eyes, and heads will be spattered with hot melted metals, causing painful burns and often blindness.

There are many dangers which the average person would recognize as such. For example, when asking a class of thirty boys what they consider harmful in misusing the ordinary machinist's vise, the reply came 100 per cent that if a finger were placed between the jaws and the vise then tightened, the finger would be crushed. The pupils forgot that no person will tighten a vise with his own finger in it. But almost no one will consider that while playing with the vise handle, slipping it up and down and forgetfully keeping a finger on the screwhead will surely cause, if not a broken, at least a badly bleeding finger or a painful blood blister. This can be demonstrated to the class by holding a piece of wood on the dangerous spot, after raising up the handle, then dropping it into place. The wood will be mashed or even splintered.

Just about the time that the demonstration with the vise is finished, the writer manages to drop his pencil to the floor, so that it rolls under the bench. Usually some boy will obligingly bend down rather hurriedly to pick up the pencil. Knowing what will follow, the writer then holds the palm of his hand just above the boy's head so that when he jumps up to return the pencil, he hits the teacher's hand instead of bumping his head on the vise or on the bench or on some tool which may be sticking out beyond the bench. At this point, it is well to explain to the class, just what would have happened if that hand had not been there to protect the boy's head. It is then easy to point out why one should never get up too quickly from a stooping position without looking up first.

The next thing is to acquaint the boys with how they are to be dressed while working in the metal shop. First, upon entering the shop, they are to remove their coats. Next, roll — not draw — their shirt sleeves up to above their elbows. Then, if they wear long neckties, tuck them into their shirts just beneath the collar button. Lastly, put on aprons and tie them at the back. If they were tied at the front, the strings might be caught in the machine and cause severe bodily injury, or even death. Impress upon the boys that there is no need to be frightened; and that no one

will get hurt if all carefully follow the instructions just given. But these safety rules must be obeyed not only at the start, but always. Another rule which must not only be remembered but always followed is never to run in the shop, but to walk carefully at all times. The person who runs may fall and injure himself, or he may injure some other person, or jostle someone who is operating a machine and thus probably harm himself, another person or persons, and the machine. *Never run in the shop.*

The next step is to introduce the students to each individual machine. This may be done as follows:

The Spinning Lathe

The first machine to be studied is the spinning lathe. Skilled people can do very interesting work on such a lathe, but the machine is extremely dangerous and the incautious have received severe injuries which crippled them for life.

Loose clothing, long sleeves, neckties and apron strings dangling down in front, all have contributed their share in causing injuries. Even turning around suddenly to walk away may cause a machine that is running, to catch hold of apron strings or other parts of loose garments and cause workers to get badly hurt. *Never turn your back* to a machine that is in motion, without first stepping backward at least two steps before turning to walk away.

Then observe the warning signs. Here is one, for instance, which says *"Danger, do not touch. If you want to use this, get instructor's permission."* This warning means just what it says. Do not touch this or any other machine unless you have received the instructor's permission. While you work at a machine, do not talk to anyone. Concentrate on your work.

The Drill Press

The drill press is a safe machine if properly used, but severe injuries may be received if one comes in contact with its belts, or if one permits a sleeve or necktie to become entangled with its boring chuck, or the drill held by that chuck. When boring a hole in any material, especially when using a large-size drill, it may happen that the drill may jam and cause the material to turn around with such force, that it may injure the operator, or the drill may break and the flying particles cause injuries.

The Squaring Shears

This machine has crippled the hands of many thousands of metalworkers. What caused those accidents? The first trouble is that those shears frequently have no guards. The people hurt may probably have been working after a night of sleeplessness or they may have indulged too heavily in alcoholic drinks. Mishaps may also occur because the worker's mind is wandering, or because he is worried or because something unpleasant has happened at home or at work. But a person may also have one or both of his hands cut off on these shears, if, while stepping with one foot on the pedal, the other foot should happen to slip on an oily, greasy floor, or on a slippery piece of metal, paper, or any other object. This would cause the worker to fall forward causing the hands to slide under the cutting edge of the shears.

Hand-Operated Machines

Some of the smaller hand-operated machines in the shop might not be considered dangerous at all. Nevertheless, they are more or less so, for almost every one of these has gears or rollers, or both, and if through absent-mindedness one gets his fingers caught while operating these innocent-looking little machines, severe injury might result.

The Cornice Brake

This machine can crush and mangle fingers dreadfully if they are placed where they should not be. Be sure, therefore, to keep your fingers away from this machine when any person is using it. Watch not only your own fingers, but also those belonging to others.

The Forming Machine

These machines if made for heavier duty, are generally manufactured with a crank on each end. Two people, are supposed to operate it. This is extremely dangerous, because two or more people can never think the same way at the same time, hence when one worker at one crank is turning, the other may forget himself, and try to do something else until the crank comes up and hits him in the face, and probably injures him badly. It is safer if the work is heavy, to have two persons turning one crank only. Therefore, if the machine in the school shop has two cranks, the safest thing is to take one off and keep it hidden.

The Buffing Lathe

This is a very useful machine but it is as dangerous as it is useful. If it is used carefully, however, no harm will come to anyone. Of course, no matter how cautious one is, one can never be too careful for this machine runs at 3,600 revolutions per minute. It may be well to give the students a number of effective demonstrations on the buffing lathe to impress on them the need of observing safety. First take a piece of rag and hold it near the buffing wheel to show how it will be snatched away by the wheel. Next hold the rag near the end of the buffer spindle to show how it is snatched away. Call the students' attention to the fact that the wheel and spindle would do exactly the same thing to an apron string, a sleeve, or a necktie, only that if anyone of the latter were thus caught, the results might be very serious. Arms have been torn off, eyes gouged out, and some have even been killed by the buffer. Next may be demonstrated how dangerous it is if the object to be polished is not held against the wheel in the right way, or when it is held against the wrong spot on the wheel. A pencil may be used in this demonstration, holding it against the wheel in the proper way. This will show the pupil how safe buffing really is, if it is done correctly. Next, tell the students to stand away from the buffer, and then show what happens to the pencil if it is held incorrectly against the wheel. It is astonishing to see how the wheel grabs the pencil and forcibly throws it to the floor or against the wall, frequently smashing it to bits. The teacher making this demonstration must be careful not to be struck by the flying pencil, because an object thrown by the buffer in this manner, is traveling with the speed and force of a bullet fired from a rifle. If it strikes a person, it will have the same effect as a bullet, only being larger, it will also do more damage.

Next point out the dangers encountered when polishing flat articles with large holes such as picture frames, calendars, and the like. Warn the students also that two persons should never try polishing on the same wheel at the same time, and that the person who is busy working on a buffing machine should never be spoken to.

Objects that are being buffed get quite hot, but do not try to handle them with gloves, rags, handkerchiefs, or with your apron. If necessary, use a piece of paper, wherewith, to hold such an object.

Oxyacetylene Welding

One of the two cylinders used in gas welding contains acetylene gas, and the other one oxygen gas. Both of these gases are very explosive, but when they are properly combined in a welding torch, a very hot flame will be produced, which will melt iron very quickly. It is easily understood then that one who uses such an outfit must be very careful not to burn himself or others who work about him. Be careful, therefore, not to turn hastily with the burning torch in hand. Instead, lift the burning torch high, see that nothing is in the way, and then turn slowly. Never light the torch before first putting on dark

glass welding goggles, and always use a gas lighter, not matches, to ignite the gases. Never open valves and regulators on gas cylinders too fast. Do these things slowly. Never start welding on any empty containers, no matter how long they have been known to be empty. Make sure they do not contain inflammables such as kerosene, gasoline, benzine, or naphtha. Containers which were used for such inflammables must be filled with fresh water several times. Then fill them with water to which some sulphuric acid has been added. Leave this solution in the container for about one-half hour, then empty it and fill once more with fresh water, otherwise the acid left in the container may corrode the inside surface. After the water has been finally drained out of the container, the welding may be attempted. Never leave a burning torch while you attend to other business. This precaution must be observed even if the operator leaves for but a short time, because the flame may be blown out by some little wind or draft. In the meantime, the gases escape into the air, and they may produce a terrific explosion when an attempt is made to light the torch again. When quitting for more than ten minutes, shut off all cylinder valves. This is necessary because one is never sure that the torch and especially the rubber hoses leading from the tank to the torch are free of leaks.

Handling Acids

When mixing acids and water, be careful never to pour water into acids, but always acid into the water. When doing this, also, be careful that the acid does not spatter on your hands or into your eyes. If this should happen anyway, set down the acid container carefully and then rinse the burnt parts with copious quantities of water. Any person who does not know the poisonous nature of cyanide should not be permitted to handle it or its solution. It is dangerous even to allow one's clothing to touch the crock in which cyanide solution is kept, because the poison penetrates even through the crock. Then, when one has touched clothing which has been in contact with such an acid crock, the poison may be carried to eyes or mouth, and blindness or death may be the result.

Miniatures as a Hobby

Earl Harmes

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Shorewood, Wisconsin

The making of miniatures and models, if rightly done, is most instructive and valuable, and the activity contains much to recommend it as a hobby.

We often speak of miniatures and models without giving full consideration to what is implied. To be of any value or interest, a miniature must be a perfect representation of the original, or in other words — an exact replica. If, because of its reduced size, some of the fine details are omitted in the construction or design, the miniature is of little value other than for decorative purposes. A perfect miniature is a thing of beauty. It offers a real challenge to the amateur craftsman in that it requires real ingenuity to figure out some of the ways these exceedingly small parts can be made. It is a hobby that requires little or no equipment and yet demands the utmost in patience and perseverance.

In these days, and during future times when the problem of more leisure con-

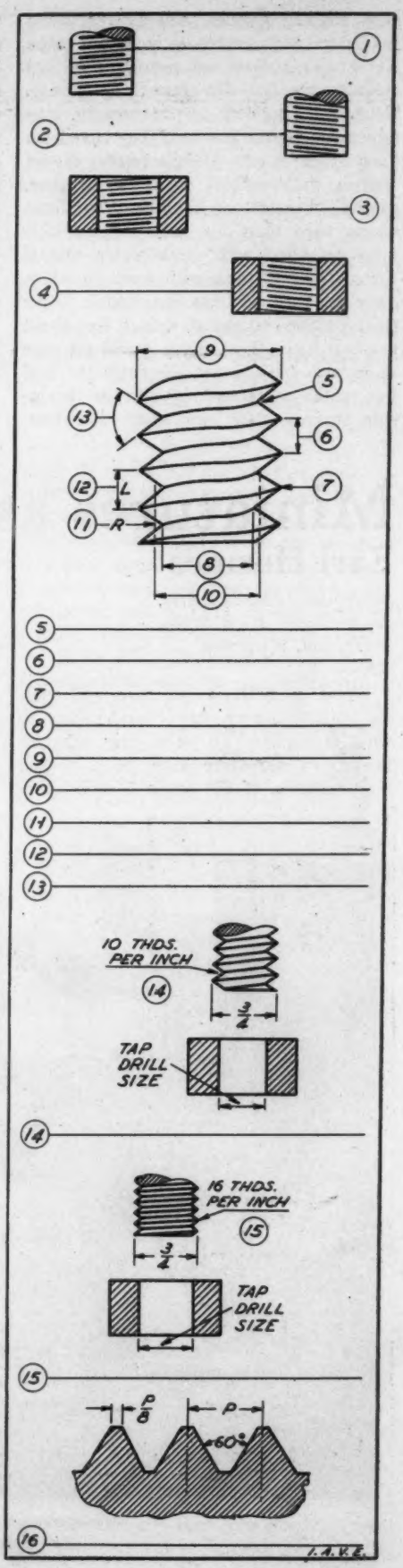
Miniatures used at the New York Times *National Book Fair, Nov. 5–20, 1937.*
The Cape Cod chair at the left is the one described in this article

fronts people, the miniature hobby is destined to hold a place of importance. The interest manifested in miniature airplanes and railroads is indicative of the future possibility in other fields. As the writer mentioned before, it offers a real challenge to one's ability and, of course, the field for the miniature hobby is wide and varied. The industrial world has recognized the value of the miniature, and scholarships and cash prizes are offered to encourage latent abilities along this line. The world of industry will always need true craftsmen regardless of the progress of the machine and, of course, the perfect miniature is the true product of one's ability.

The miniature Cape Cod chair in the accompanying illustration required approximately 70 hours to construct, in fact just about twice the length of time required for making the original. It was made to a scale of 3/16 in. equals 1 in. So delicate and minute were some of the details that many hours had to be spent just planning ways and means of construction. The mortise-and-tenon joints and the pin or wedge joints offered many problems, but once conquered, were sources of real joy. The apparently simple job of drilling the holes for the legs was perhaps the most difficult to solve. The final outcome was that small jigs had to be constructed to make possible the proper angles for the legs. After all the parts were made and assembled, it was necessary to take everything apart again so that each piece could be finished separately. This was necessary because of the diminutive size of the chair which made it exceedingly difficult to get into the small corners involved. The finish used was the typical early American brown-pigmented surface.*

After all the parts were carefully rubbed, the small New England chair was assembled and glued for the last time. What a task, and yet what joy to see this perfect little chair. Not one detail had been omitted. It lost none of the simple beauty and grace which was so typical of the furniture of our forefathers. It was time well spent and every hour of work was thoroughly enjoyed. The miniature was made up for the *New York Times* National Book Fair.

**For formula, see page 13, Furniture of Yesterday and Today, Harmes, Bruce Publishing Co., Milwaukee, Wis.*



Testing and Tests

TEST FOR HOUSEHOLD-MECHANICS CLASS

T. L. Stanaway, West Junior High School, Lansing, Michigan

Following is a group of incomplete sentences. Read each sentence carefully, then fill in the word, or words, which will make it complete.

1. Five important tools and materials needed to do a glazing job are ———, ———, ———, ——— and ———.

2. Single-strength glass is ——— inch thick; plate glass is ——— inch thick; double strength glass is ——— inch thick.

3. A new sash should always be ——— with ——— or ———.

4. The glass is held in place by ——— ———.

5. The wind and rain are kept out by the ———.

6. It takes putty ——— to dry.

7. Glass is cut to the desired size by a ———.

Number attempted ———. Number wrong ———. Score ———.

Following is a group of incomplete statements. After each statement are three phrases, each preceded by a number. Place a circle around the number at the end of the statement which corresponds to the right answer.

1. Plate glass is
1. 1/8 inch thick. 2. 1/64 inch thick.
3. 1/4 inch thick. 1 2 3

2. Glazier's points are put into the sash with a
1. Saw. 2. Glazier's hammer.
3. Claw hammer. 1 2 3

3. Double-strength window glass is used
1. In pictures. 2. For glass bottles.
3. In windows. 1 2 3

4. Glazier's points are used to hold the
1. Glass in place. 2. To keep wind out. 3. To strengthen the sash. 1 2 3

5. Putty will dry in
1. 2 days. 2. 5 days. 3. 2 months. 1 2 3

Number attempted ———. Number wrong ———. Score ———.

Following is a group of statements, some of which are true, and some of which are false. Read carefully each statement, and if you think it is true draw a circle around the capital T. If you think is it false draw a circle around the capital F.

1. Single-strength window glass is 1/16 inch thick. T F
2. A new sash should be primed with oil or paint to make it look good. T F
3. Glazier's points are used to hold the putty in place. T F
4. It takes putty two days to dry. T F
5. Putty is used to keep the wind and rain out. T F

Number attempted ———. Number wrong ———. Score ———.

MACHINE-SHOP PRACTICE

Harry A. Jones,
Vancouver, B. C., Canada

Information Test

Object of Test — To test student's knowledge of the representation of internal and external threads, the parts of a thread and tap drill size.

Directions: Write the name of the part opposite the number.

Problems and Projects

COMBINATION PAPERWEIGHT AND PENHOLDER

William E. Haynes,
Jamaica Vocational High School,
Jamaica, L. I., New York

Reference to a similar project described and illustrated on page 19 of the January, 1937, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will prove helpful. The following features make the project herewith described a favorite in industrial-arts and vocational classes:

1. Small amounts and several kinds of material may be used. An especially fine combination is steel with chromium plating. However, any material such as brass, copper, or aluminum, with a lacquer finish, produces an attractive article.

2. It requires skill and accurate measurement to produce a satisfactory job.

3. It employs the use of angle and radius cutters, and the shaper head on a job that is practical and useful, in contrast with pseudo jobs.

4. Possession and utility make it self-motivating.

5. Three distinct mathematical problems can logically be derived from it:

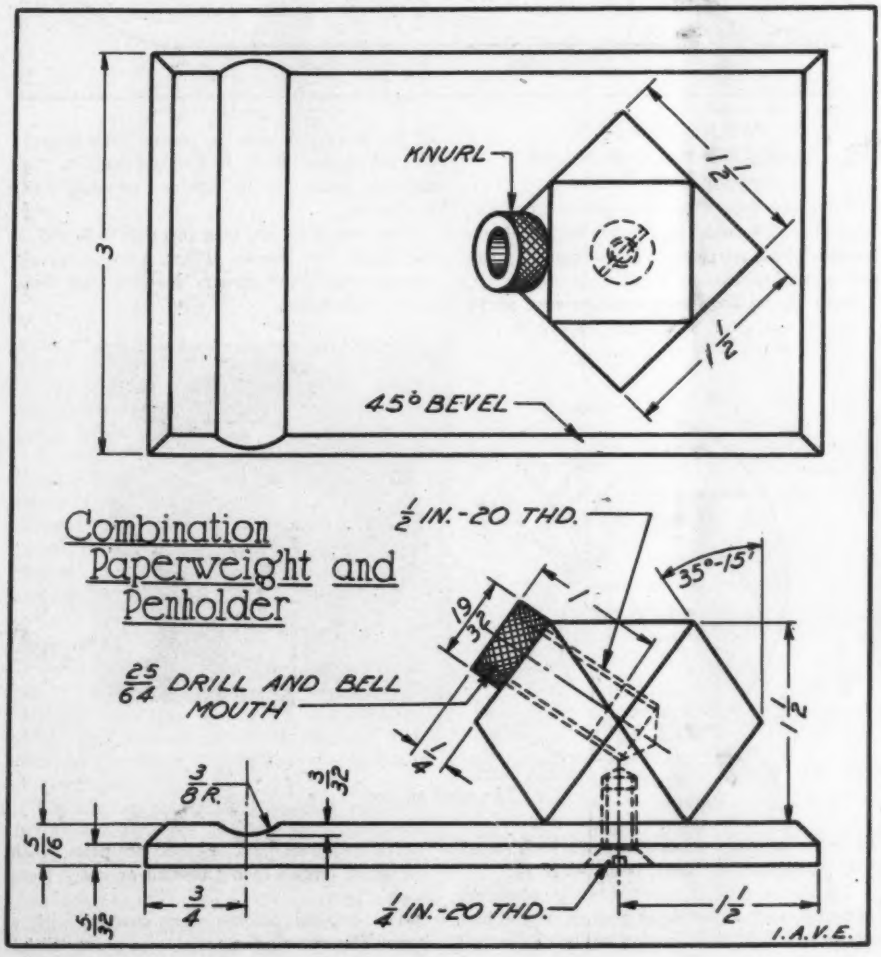
a) The verification of the angle 35 deg. 15 min.

b) The verification of the knurled diameter of the bushing so that it will be tangent to the edges of the triangular facet.

c) The calculation of the width of the circular groove, using the depth and the radius, especially if a different cutter is the only one available.

6. A practical illustration of the adaptability of a fine thread to secure a thin wall.

7. It is well to turn the bushing on a longer piece and finish it entirely before cutting it off and scraping it bell mouthed.



MINIATURE LOVING CUP

Roy M. Carter, Westport Junior High School, Kansas City, Missouri

A very effective miniature loving cup can be made in any industrial-arts shop which is equipped to do soldering. This cup can be used for an individual trophy in all kinds of contests such as are carried on in schools.

The cup consists of a common sewing thimble for the bowl, two small safety pins for the handles, and one collar button for the base.

Miniature loving cup

In selecting these items, be sure they are made of materials that are easily soldered. If a chromium plated thimble is selected, the plating can be cut sufficiently with muriatic acid for soldering.

Solder the articles together as shown in the illustration. Be sure that the open side of the safety pin is put toward the outside. The pin can then be opened and closed, allowing the student to wear the cup as an ornament.

Clean well to remove all acid and polish with steel wool. The cup can be given a commercial plating in various finishes if an extra nice cup is desired.

SUBSTITUTE FOR LEVEL WHEN PUTTING UP A SHELF

Frank Bentley,
Clinton, Iowa

To get a shelf perfectly level when putting it up, one of course needs some kind of a leveling tool, at least a square, though if the eye is to some extent reliable one can get some distance away and, sighting with a fair degree of accuracy, get the shelf up fairly level. Only too often however the job is a hurried one, attempted with no other tool handy than a screw driver, and the shelf usually is to be put up in cramped quarters where it is impossible to rely on the eye's judgment. A

good job can, however, be done as shown in the illustration, even without a level. Tie one end of a piece of string to a common pin and stick it in the wall, attaching some small object to the other end of the string, so that it will act like a plumb bob. When the string is down and, of course, perpendicular, hold one end of a fairly large book close to and parallel to the string. Use the top edge of the book to scribe a light line on the wall at right angles to the string, as shown. Then, holding the

bottom or top of the shelf to the line drawn, fasten the shelf to the wall.

LEATHER LINK BELT

Gerald Baysinger and Hartley Schaal,
Detroit Public Schools,
Detroit, Michigan

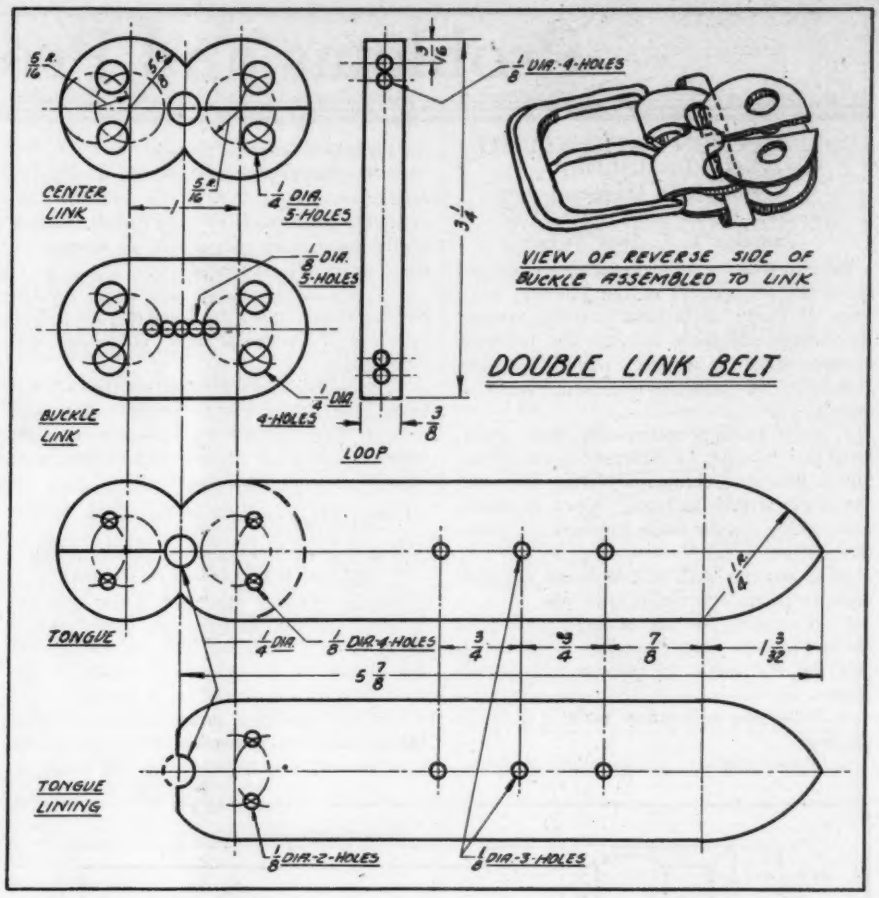
The leather link belt, which requires approximately four hours for completion, is made from inexpensive leather scrap which usually can be obtained locally. Upholstery shops, automobile salvage departments, shoe-repair shops, and companies which manufacture leather goods are sources of supply. The kinds and colors of leather obtained will, of course, vary with the source. However, most kinds, with the exception of sole and machine-belt leathers, are usable. The colors preferred are black, gray, and various browns. The 1¼-in. buckle needed for the belt can be obtained at a moderate price from most leather supply companies. Although most boys can secure suitable buckles from home, it is desirable to have some buckles on hand for those unable to get them. Rubber cement, used in cementing the lining to the tongue, can be bought economically through a shoe-repair shop.

Only a few tools are needed to make the belt. The parts are cut out with common scissors. Patterns for these parts, which are needed for each boy, may be mimeographed or otherwise duplicated on any heavy paper or cardboard. If such facilities are not available, individual paper patterns can be made from master patterns of sheet metal. The two sizes of leather drive punches needed, are ⅛ in. and ¼ in. These may be purchased from leather supply houses, or they can be made in the school metal shop. Directions for making satisfactory leather drive punches appear on page 434 in the December, 1937, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

The link belt is not a new project. There are a number of commercial link belt kits available, and designs for link belts are numerous. The design suggested is simple, does not require the use of snap fasteners, and has been used successfully in summer craft programs. Boys and girls between the ages of ten and fourteen like to make these belts, and usually turn out very acceptable jobs.

Procedure

1. Cut one buckle link of leather, and fold it over the buckle bar with the tongue of the buckle extending through the slot in the link.
2. Cut one center link and one loop of leather. Insert the center link, cut open on one end as shown on the pattern, through the holes in the belt link and loop. A study of the sketch will make this procedure clear.
3. Cut out and assemble as many center links as are needed for the belt length desired.
4. Cut out the tongue and the tongue lining, and apply rubber cement to the flesh or unfinished surfaces. When the cement becomes tacky, press the two pieces together. Punch the holes as indicated on the pattern, and insert the tongue in the last center link.
5. Cut a ¼ by 6 in. strip of leather, insert it through the holes in the tongue, and tie a square knot in back. Flatten the knot with a wooden mallet, and trim the ends neatly.



WALL PLAQUE

Stanley Bowen, High School,
Salem, New Jersey

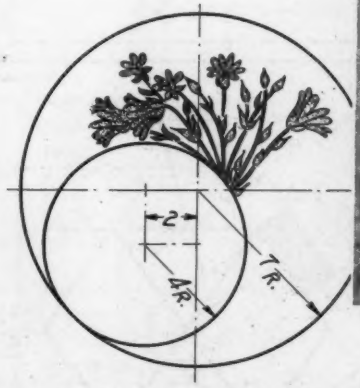
While the type of project shown here may be made in the shop, it is more suited for use in high-school art classes. The design may suggest other applications of different motifs.

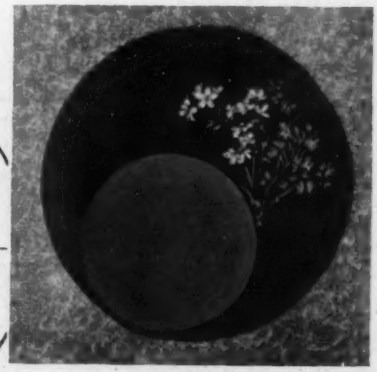
Both circles are band-sawed to size, of ¼-in. material then sanded smooth and round. Hard composition board is satisfactory.

The large disk is covered with upholstery material, such as artificial leather, or the like, or some fabric that harmonizes with the rest of the room in which the plaque is to hang.

The smaller circle is finished with a contrasting color of flat paint, or dull-finish enamel.

The two disks are held together with No. 3 by ⅜-in. f.h. screws. Place an appropriate spray of artificial flowers between the disks when assembling.





The wall plaque

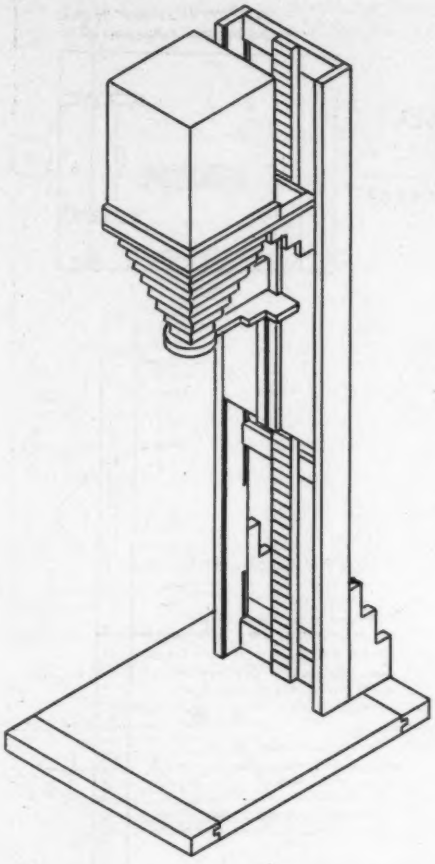
The plaques may be used in pairs, with the small circles facing toward or away from each other.

The original plaques were covered with a brown slip-covering material with orange disks.

ENLARGING CAMERA

Carl R. Bellwood, Stratford, Connecticut

Excellent results in enlarging have been produced by amateur photographers with makeshift arrangements of their own design. It was usually accomplished after many tedious hours of experimenting and adjusting of the various parts of the apparatus.



The purpose of this article is to describe and illustrate an enlarger which may be made easily and which will cost approximately $5.

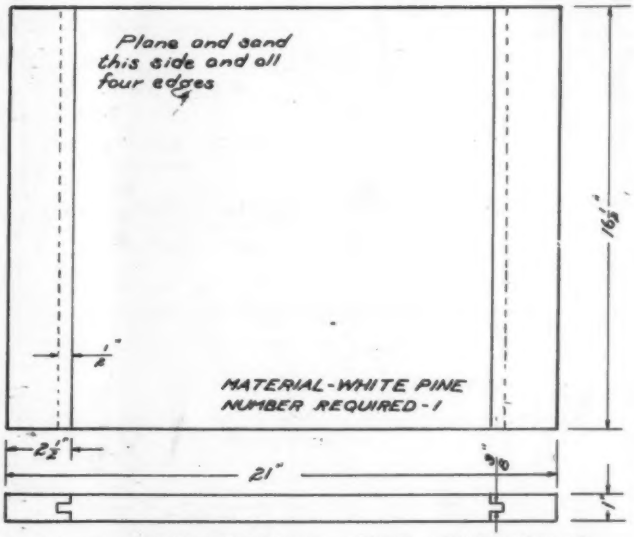
It may be necessary to change some of the dimensions given, depending upon the lens which is available, or the builder may wish to make a larger or smaller machine. This, of course, is left up to him, depending upon the degree of his knowledge of lenses and photography in general.

Good results were obtained with the machine shown, equipped with a lens from a Brownie camera and a 100-watt bulb. The exposure on bromide paper was from 1 to 3 minutes, depending on the degree of enlargement. This process may be speeded up, however, by the use of a more powerful bulb and a faster lens.

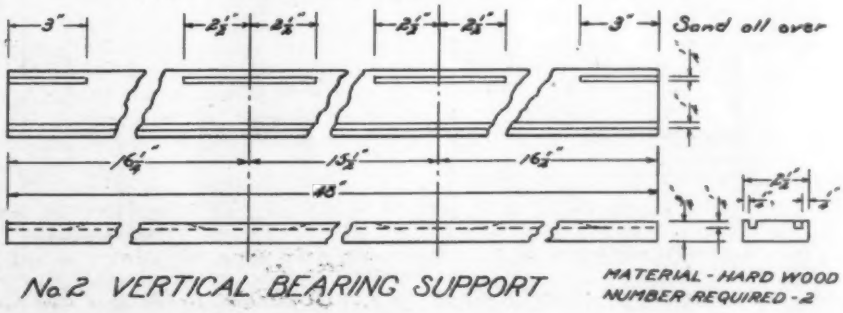
The camera may also be used for copying. In this case, a piece of unexposed film would be placed in the negative holder and the picture to be copied placed on the baseboard. A desk lamp would serve as illumination on the picture during exposure.

Bill of Material

Part No.	No Required	Name	Material	Size
1	2	Baseboard for exposing	White pine	1 x 2½ x 16½
	1	Baseboard for exposing	White pine	1 x 16½ x 17 or boards to make up this dimension
2	2	Vertical bearing support	Hardwood (gum or oak)	¾ x 2½ x 48
3	4	Braces for stand	Hardwood (gum or oak)	¾ x 1¾ x 8½
4	2	Brackets for stand	Hardwood (gum or oak)	¾ x 3½ x 8½
5	1	Ratchet support	Hardwood (gum or oak)	⅝ x 1½ x 48
6	1	Plain bracket for lens support	Hardwood (gum or oak)	½ x 6 x 6
7	1	Front bracket for lens support	Hardwood (gum or oak)	½ x 3½ x 5½
8	1	Rear bracket for lens support	Hardwood (gum or oak)	½ x 2½ x 5½
11	1	Bracket for negative frame	Hardwood (gum or oak)	½ x 3½ x 4
12	1	Lens holder	Hardwood (gum or oak)	¾ x 4 x 4
14	2	Negative frame	Hardwood (gum or oak)	¾ x 1 x 7
	2	Negative frame	Hardwood (gum or oak)	¾ x 1 x 11½
15	1	Base for object-distance adjustment	Hardwood (gum or oak)	½ x 8½ x 18½
	2	Base for object-distance adjustment	Hardwood (gum or oak)	½ x 1 x 18½
18	4	Framing for light diffuser	Hardwood (gum or oak)	¼ x ¼ x 6 1/16
19	4	Framing for light diffuser	Hardwood (gum or oak)	¼ x ¼ x 6 1/16
D	4	Light box	Hardwood (gum or oak)	½ x 1 x 7 13/16
	4	Light box	Hardwood (gum or oak)	½ x 6 13/16 x 11¼
	1	Light box	Hardwood (gum or oak)	½ x 7 1/16 x 7 1/16
9	1	Bushing for thumbscrew	Brass, round	¼ x 1
10	1	Thumbscrew	Brass, round	1 x 1½
13	1	Ratchet spring	Spring steel	.042–.050 x ½ x 4
16	1	Bellows	Top material (Sears Roebuck & Co. catalog No. 28–7394)	17 x 28
17	1	Light diffuser	Opal glass	1/16–3/32 x 5 13/16 x 5 13/16
20	2	Negative holder	Window glass	6⅜ x 6⅜
		Spikes		
		Light socket		2—3/16
		Insulated wire		
		Nails, brads, screws	Lens from a camera	Stain, shellac, wax



No. 1 BASEBOARD FOR EXPOSING



No. 2 VERTICAL BEARING SUPPORT

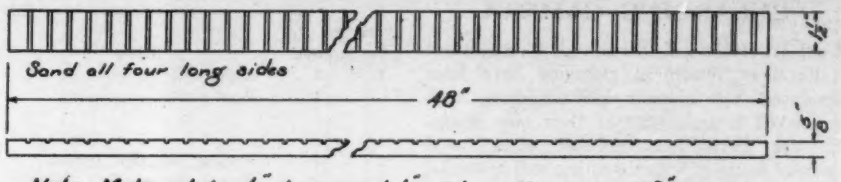
Explanation of the Construction of the Various Parts

No. 1. Baseboard for Exposing

a) Make a groove ⅜ in. wide and ½ in. deep along one edge of two pieces of white pine, 1 x 2½ x 16½.

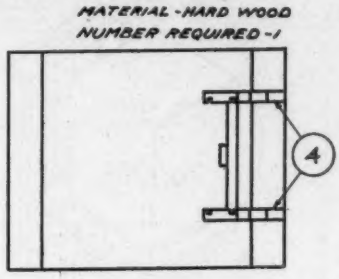
b) Cut another piece of white pine 1 x 16½ x 17 (if it cannot be obtained 16½ in. wide, take enough pieces to make this dimension and glue them together), and cut a tongue ⅜ x ½ in. on each end.

c) Glue tongue-and-groove parts together. Place in clamps and allow to set overnight.



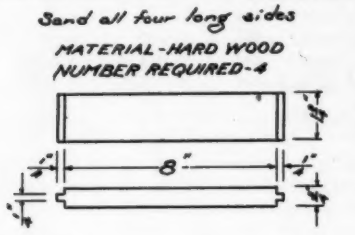
Note: Make slots $\frac{1}{8}$" deep and $\frac{1}{8}$" wide with centers $\frac{3}{4}$" apart. They are to continue in this manner the full length of the piece.

No. 5 RATCHET SUPPORT

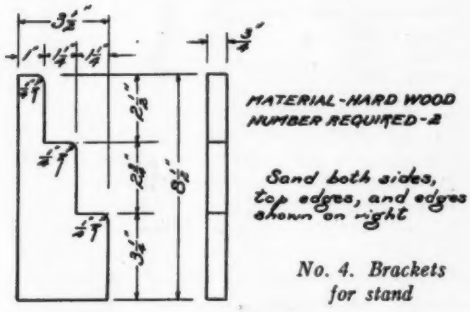


No. A STAND

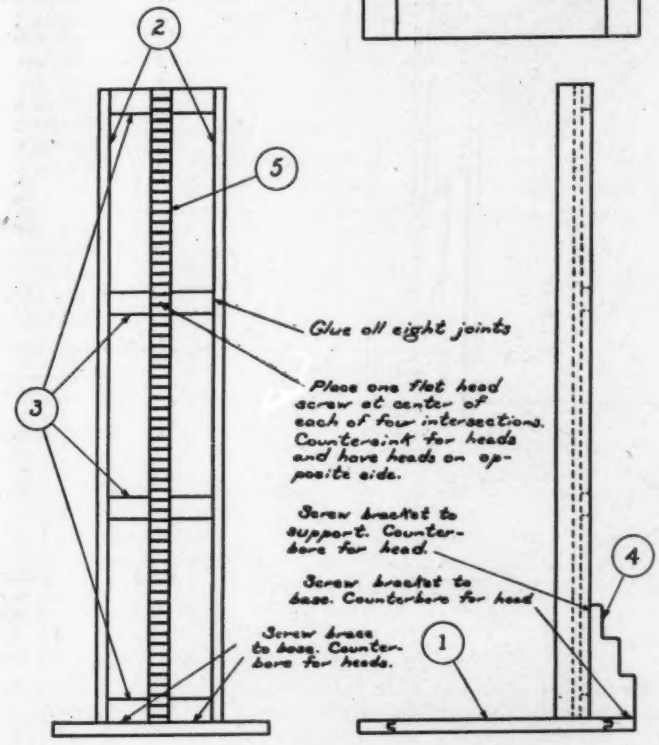
PARTS REQUIRED-No. 1,2,3,4,&5

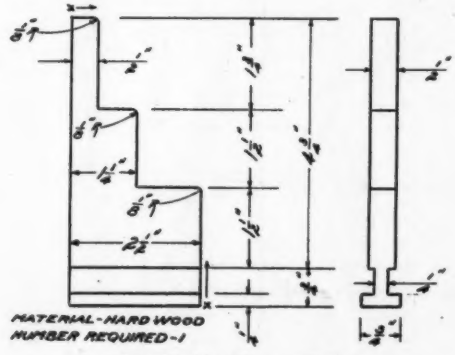


No. 3. Braces for stand

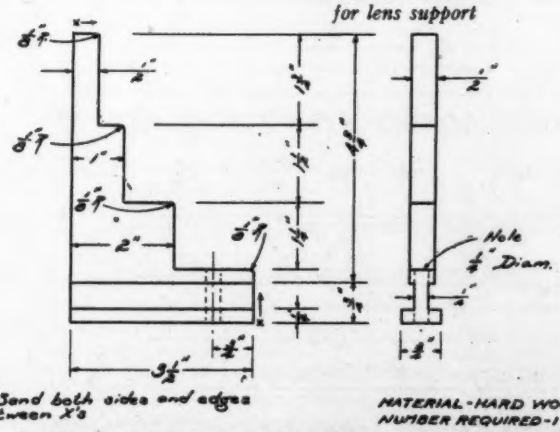


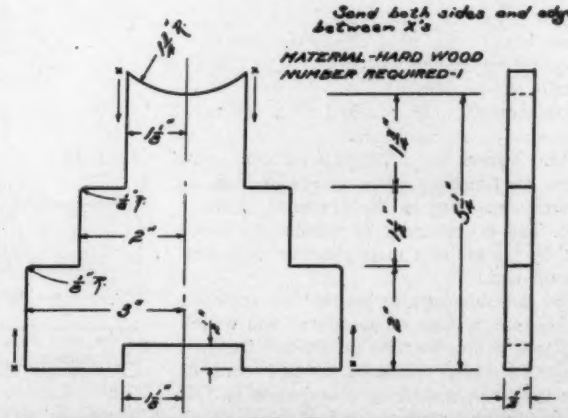
No. 4. Brackets for stand


2
5
3
4
1
Glue all eight joints
Place one flat head screw at center of each of four intersections. Countersink for heads and have heads on opposite side.
Screw bracket to support. Counterbore for head.
Screw bracket to base. Counterbore for head
Screw brace to base. Counterbore for heads.



No. 8. Rear bracket for lens support





No. 7 FRONT BRACKET FOR LENS SUPPORT No. 6 MAIN BRACKET FOR LENS SUPPORT

d) Scrape off all glue and sand all parts of board.

e) Apply a coat of white shellac and allow to dry about three hours. Rub down with steel wool and apply a second coat.

No. 2. Vertical Bearing Support

The short grooves are made by merely laying the board over the blade of the power saw and sliding it until the groove is the desired length. The board is then lifted from the saw. Since these grooves are merely for jointing, it is not necessary to have them the full length, although they may be made thus if the builder so desires. Both pieces must be sanded all over and the walls of the long grooves must also be thoroughly sanded.

No. A. Stand

a) Assemble parts 1, 2, 3, 4, and 5 as indicated on the drawing.

b) Use your judgment on the size of screws to be used.

c) Be sure that the baseboard is at perfect right angles with the vertical bearing supports.

d) After everything is properly lined up, remove the baseboard from the rest of the assembly.

e) Remove all glue from the assembly and give it a general going over with sandpaper.

No. 5. Ratchet Support

a) Make slots ⅛ in. deep, approximately ⅛ in. wide and with centers ¾ in. apart.

b) The distance between the end slots and the ends of the piece is immaterial. The slots must, however, be over the full length of the piece.

c) Sand all over. *Caution:* Do not round corners of slots in sanding.

f) Stain it either walnut or mahogany and apply a coat of shellac. After this is dry, rub it down with steel wool and apply another coat and rub it down once more.

g) Apply a coat of furniture wax and thoroughly polish. Repeat this process after about a day.

h) Assemble back on baseboard.

No. 7. Front Bracket for Lens Support

It will be noticed that the entire piece is ½ in. thick except for a small portion at the bottom, which is ¾ in. The best way to tackle this is to make a tongue ¼ by ¾ in. on a piece of stock and glue a strip of ¼ by ¼ in. on either side.

No. 8. Rear Bracket for Lens Support

Do the same on this as on No. 7.

No. 9. Bushing for Thumbscrew

a) Take a piece of round brass ¼ by 1 in. and drill straight through. Also tap it the full length of the piece.

b) Knurl the outside. This is done so that the glue will have surface to stick on when the piece is glued into place.

No. 10. Thumbscrew

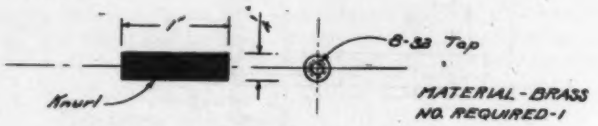
If the builder so desires, he may get this nickel plated. This improves the appearance greatly.

No. 13. Ratchet Spring

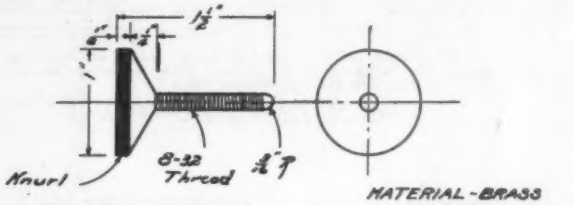
a) Take a piece of spring steel the required size.

b) The cutout for the fork can best be made by drilling a small hole and then completing the rest of the cut with a jig saw.

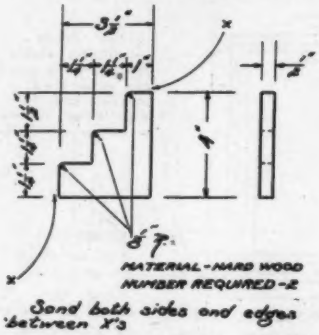
c) After the piece is complete, harden it. This is done by heating it to red heat and then quenching it in either water or oil. Rub



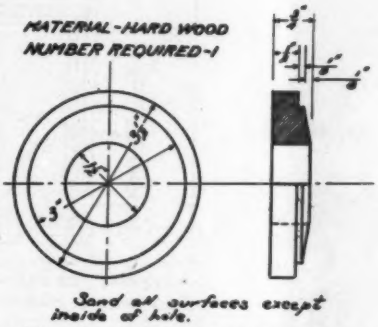
No. 9 BUSHING FOR THUMB SCREW



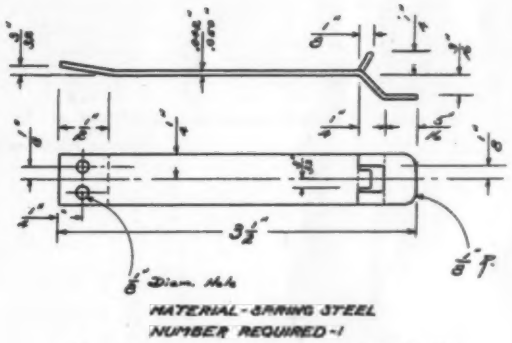
No. 10 THUMB SCREW



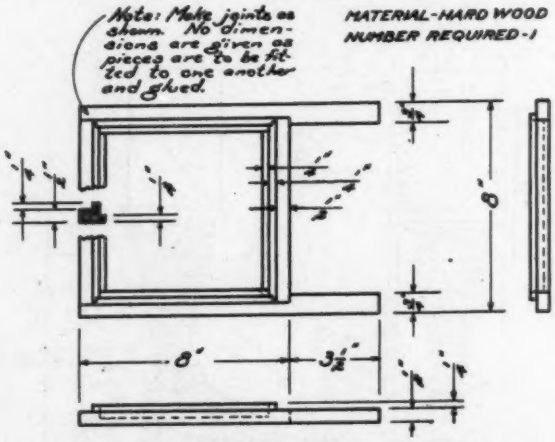
No. 11 BRACKET FOR NEGATIVE FRAME



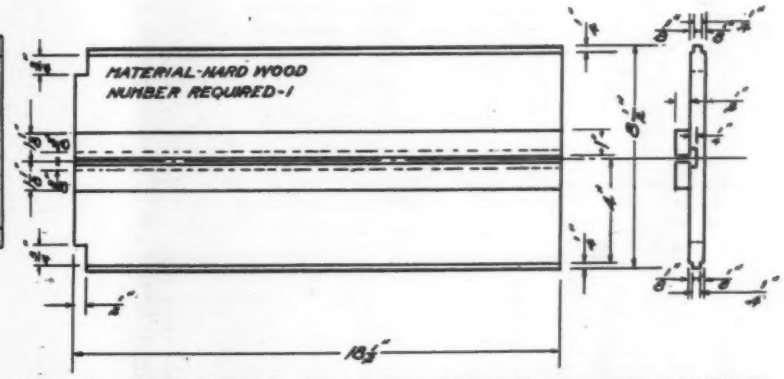
No. 12 LENS HOLDER



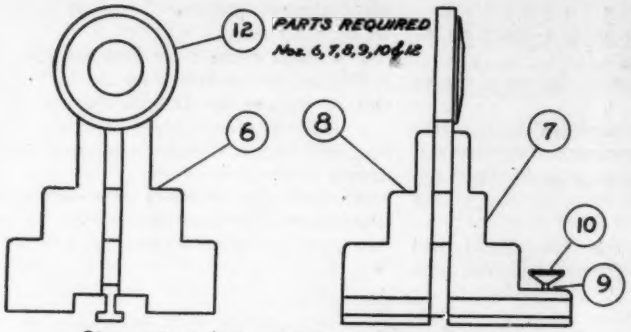
No. 13 RATCHET SPRING


Note: Make joints as shown. No dimensions are given as pieces are to be fitted to one another and glued.
MATERIAL - HARD WOOD
NUMBER REQUIRED-1

No. 14 NEGATIVE FRAME

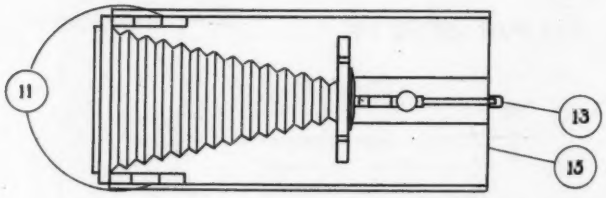


No. 15 BASE FOR OBJECT DISTANCE ADJUSTER

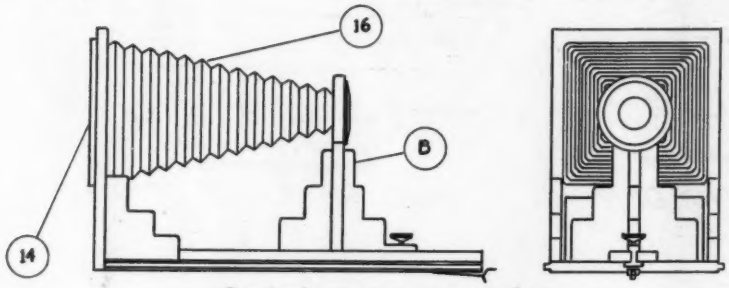


Glue and nail 7 and 8 to 6. Glue 12 in place. Also glue the bushing 9 in place. This bushing serves as a thread for the thumb screw 10.

No. B LENS SUPPORT

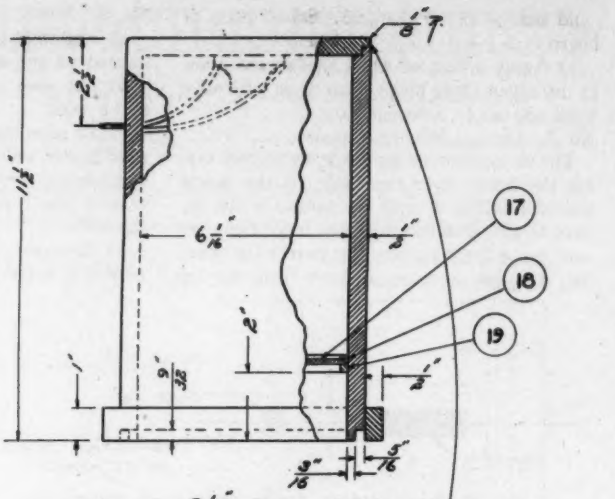


PARTS REQUIRED - Nos. 8, 11, 13, 14, 15 & 16



Sand and scrape bearing surfaces so that B will slide on 15 easily but with very little play.

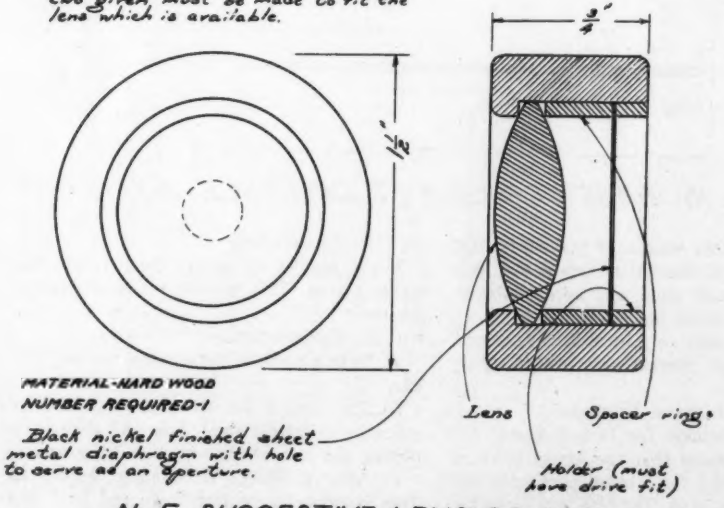
No. C OBJECT DISTANCE ADJUSTER


17
18
19
Note: Make joints as shown. No dimensions are given as pieces are to be fitted to one another and glued.
¾" spikes cut 1½" long to serve as plug for lead to source of current.

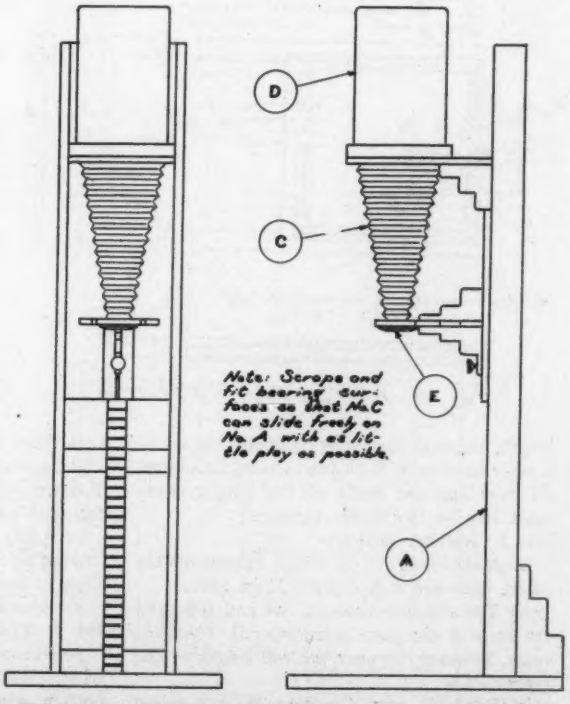
MATERIAL FOR CASING - HARD WOOD
ADDITIONAL PARTS REQUIRED - Nos. 17, 18, 19

No. D LIGHT BOX

Note: All dimensions except the two given must be made to fit the lens which is available.


MATERIAL - HARD WOOD
NUMBER REQUIRED - 1
Black nickel finished sheet metal diaphragm with hole to serve as an aperture.
Lens
Spacer ring
Holder (must have drive fit)

No. E SUGGESTIVE LENS COLLAR



COMPLETED ENLARGING CAMERA

the piece down with emery cloth until it is fairly clean. Then heat it until the entire surface is a deep blue, and quench once more.

No. B. Lens Support

a) Assemble the pieces as shown on the drawing.

b) Be sure that everything is perfectly centered and that the grooves on Nos. 7 and 8 are at right angles with No. 6 and that the grooves are perfectly lined up.

c) Scrape off all glue, and sandpaper smoothly.

d) Finish up the same as No. A stand.

No. 14. Negative Frame

The type of joint shown on the drawing is rather difficult to make, but it is a type which will not allow light to creep through even if the wood should warp and the joint open up.

No. 15. Base for Object-Distance Adjuster

a) Take a piece of stock ½ by 8½ by 18½ and put a tongue on each side as shown. Also make a groove as shown in the center. Cut corners out as shown.

b) Take two pieces of stock ½ by 1 by 18½ and place them as shown. These are held in place by five screws on each piece. Countersink for the heads.

No. 16. Bellows

This is hard to illustrate how the bellows are to be made. Probably the best way to do is to cut out the blank and make the first fold, and then inspect the folds on the bellows of some camera before proceeding farther.

No. C. Object-Distance Adjuster

a) Glue parts 11, 14, and 15 together. Also put in a few wire brads of the proper size to give it added strength.

b) Be sure that Nos. 14 and 15 are at perfect right angles to one another.

c) Sand and scrape bearing surfaces so that No. B will slide on No. 15 easily, but with very little play.

d) Scrape all glue off the assembly made up of Nos. 11, 14, and 15 and give it a general going over with sandpaper. Then stain, shellac, and wax as was done on No. A stand.

e) Try the No. B lens support on No. 15. It may need some further scraping. If it is not too stiff, just place a little paraffin on the bearing surface.

f) Next put No. 13 ratchet spring in place with two round-head screws of proper size.

No. D. Light Box

a) Take four pieces of stock ½ by 6 13/16 by 11¼ and joint them as shown on the drawing. Glue and nail.

b) Likewise, take a piece ½ by 7 1/16 by 7 1/16 and fit that into place as shown on the drawing. Glue and nail.

c) Then take four strips ½ by 1 by 7 13/16 and fit and joint them as shown on the drawing. Glue and nail.

d) Drill holes for spikes a little undersize and drive spikes in place.

e) Put electric socket in place.

f) Solder leads to spikes and attach other ends to terminals on socket.

g) Nail pieces No. 18 in place in such a way that the opal glass will be 2 or 3 in. away from the bulb to be used.

h) Place bulb in socket.

j) Put opal glass in place.

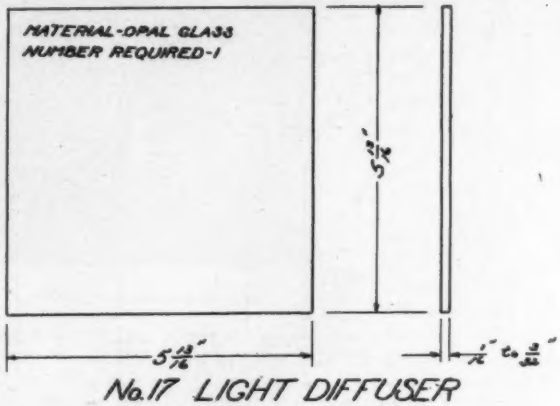
k) Put pieces No. 9 in place. It is best to fasten these with little screws as the glass will have to be removed when the bulb is changed.

l) Remove all glue from box and sand all over.

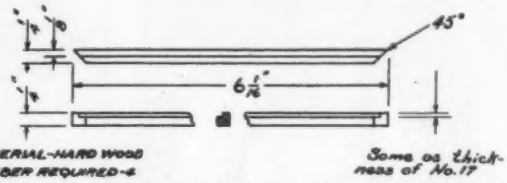
m) Finish the same as the No. A stand.

No. 20. Negative Holder

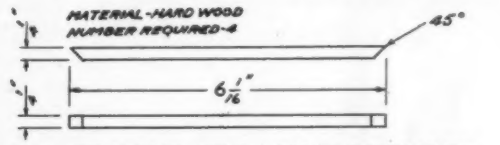
a) A convenient way would be to cement a strip of cloth on one side so that it will serve as a hinge for the two pieces of glass. Thus, they can be opened like a book and the negative placed in between.



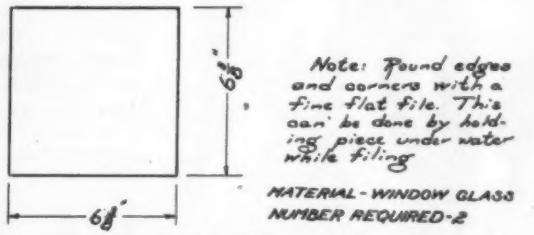
No. 17 LIGHT DIFFUSER



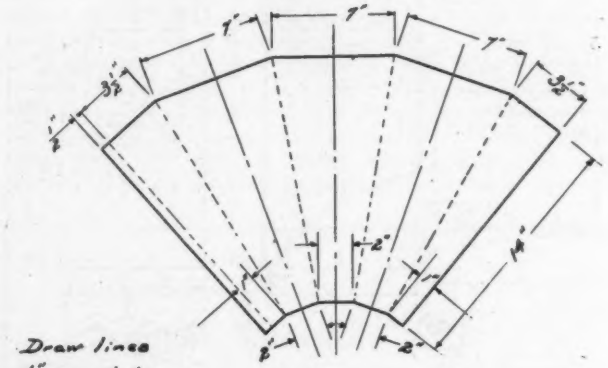
No. 18 FRAMING FOR LIGHT DIFFUSER

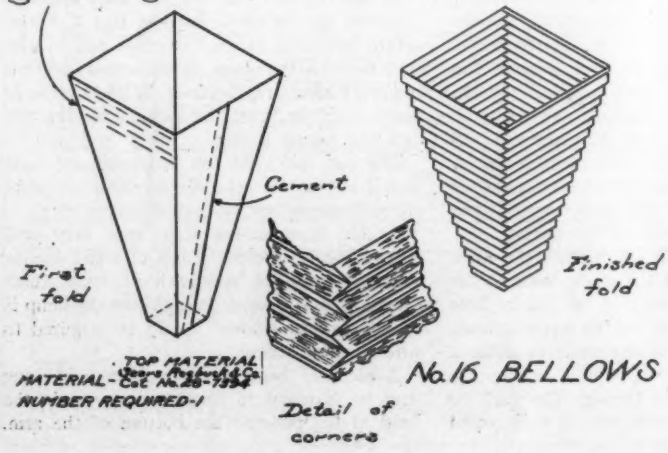


No. 19 FRAMING FOR LIGHT DIFFUSER


Note: Round edges and corners with a fine flat file. This can be done by holding piece under water while filing
MATERIAL - WINDOW GLASS
NUMBER REQUIRED-2

No. 20 NEGATIVE HOLDER





No. 16 BELLOWS

No. E. Suggestive Lens Collar

This is merely a suggestion as to how the lens may be held in place. The style will depend on the lens to be accommodated. The builder will have to use his judgment in this matter.

Completed Enlarger

a) Sand and scrape the bearing surfaces on No. A and No. C so that they will slide on one another freely but with very little play. Then place a little paraffin on the bearing surfaces.

b) The ratchet spring fits into the slots on No. 5. This makes it easy to adjust the camera for any size of picture.

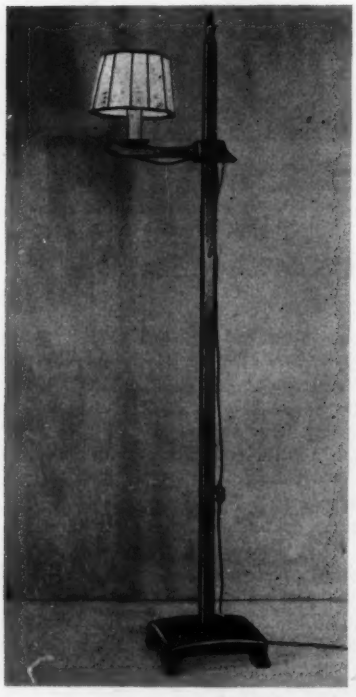
COLONIAL FLOOR LAMP

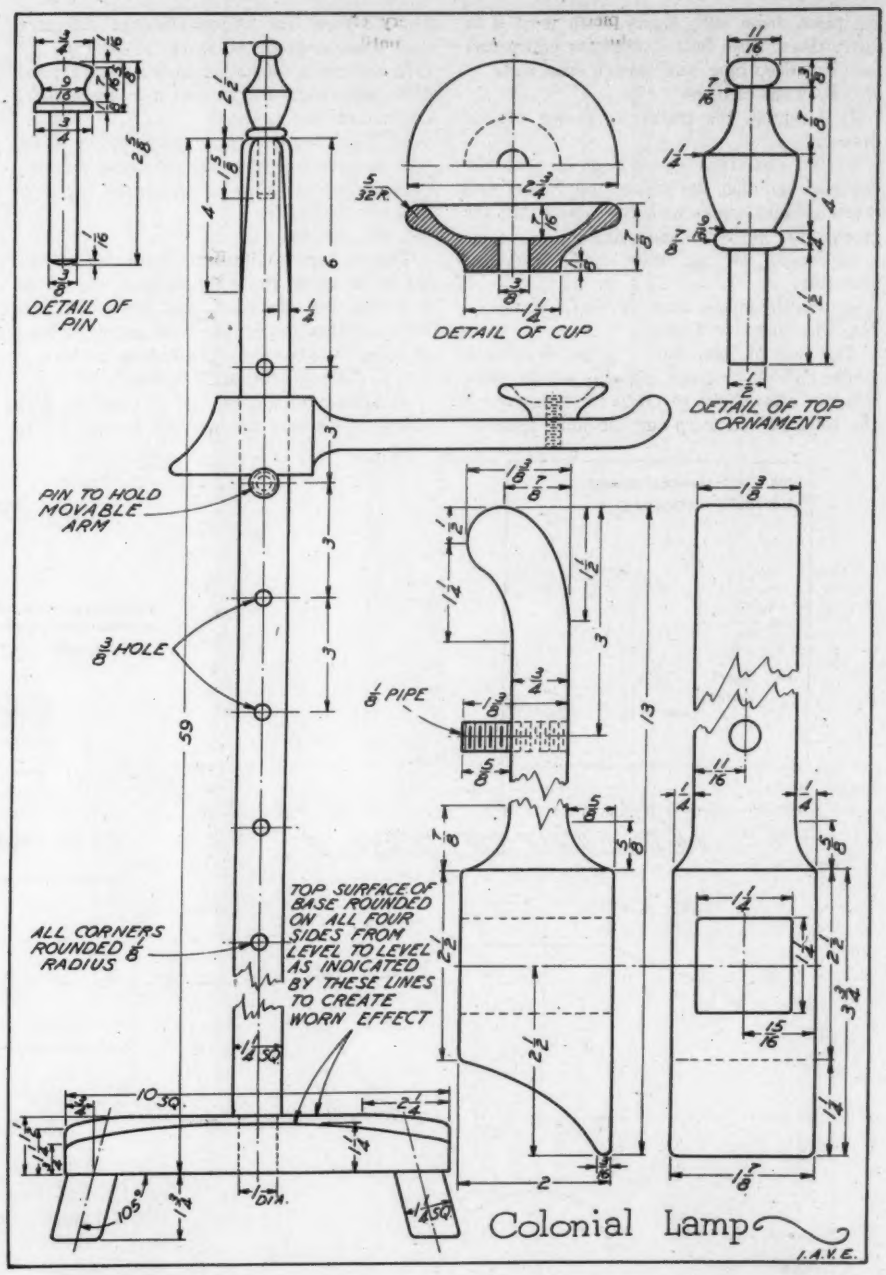
Ralph M. Merry, High School, Malden, Massachusetts

The attractive colonial floor lamp described herewith may be made out of maple or birch.

Bill of Material

No. Required	*Name*	*Size*
1	Base	½ x 10 x 10
4	Legs	1¼ x 1¼ x 4
1	Shaft	1¼ x 1¼ x 59
1	Top ornament	1⅜ x 1⅜ x 5
1	Arm	1⅞ x 2 x 13
1	Cup	⅞ x 3 x 3
1	Pin	⅞ x ⅞ x 3½




DETAIL OF PIN
DETAIL OF CUP
DETAIL OF TOP ORNAMENT
PIN TO HOLD MOVABLE ARM
⅜ HOLE
⅛ PIPE
ALL CORNERS ROUNDED ⅛ RADIUS
TOP SURFACE OF BASE ROUNDED ON ALL FOUR SIDES FROM LEVEL TO LEVEL AS INDICATED BY THESE LINES TO CREATE WORN EFFECT
Colonial Lamp
I.A.V.E.

Directions

Square up the base and bore holes for the shaft and legs. Take care to bore the hole for the shaft at 90 deg. so that it will stand perfectly vertical. The holes for the legs are to be bored all the way through to receive the wedged legs. Make a template for the sides. The base is to be 1¼ in. wide at the middle and gradually slopes to ¾ in. at the sides. Transfer this design on all four sides of the base. The worn effect goes back to 2¼ in. on the top surface of the base. One end of each leg is turned to ¾ in. diameter and 1¾ in. long, to fit into the four ¾-in. holes. A wedge is driven into the top of each leg after it is fitted and glued. The wedges are driven diagonally across the ends of the base.

Square up the shaft. To produce the worn effect at the top, work the stock down to the dimensions shown. Bore a ½ by 1⅝ in. hole into the top of the shaft for the top ornament. Work the lower end of the shaft to make a tight fit in the base.

Bore six ⅜-in. holes through the shaft to adjust the arm. The first hole is 6 in. down from the top and the rest are 3 in. apart.

Square up the stock for the arm. Cut the square hole 2½ in. in from the end of the arm. Lay out the shape of the arm as shown, and work down to the lines. A ⅜-in. hole is bored 3 in. in from the end to receive the cup and candle socket.

The cup, pin, and top ornament are next turned out in the lathe. Be sure that all parts are well sanded and soften all edges.

A thin burnt-umber stain goes very well on this project. Several coats of white shellac should be applied and each of these coats should be well rubbed down. When the lamp is completed, the student should be required to wire it up at school.

A piece of brass or iron chain 9 in. long may be fastened to small screw eyes in the head of the pin and the bottom of the arm.

A GLUE BALANCE FOR THE SHOP

Louis Barocci, High School, Cudahy, Wisconsin

The glue balance illustrated was designed and built by a student enrolled in Mechanical Drawing III. One of the requirements in this drawing course is that the student design and build some simple jig, pulley guard, or other problem of similar nature which the teacher thinks is within the ability of the student and for which there is a demand, either in the school shop or elsewhere.

The teacher generally has a list of problems which need solving and which are within the ability of the student. The student selects his problem from his list, or the teacher assigns a particular problem. If after a week or two of work on the problem, the student seems to make no headway, he is allowed to go on to the other work of the course Frequently the teacher assigns the same problem to two or more boys, and thus creates a competitive spirit among them. Oftentimes they surprise themselves and the teacher with the creative ability which they show. A number of the "utilities" designed and built by boys are in use in our school shops. The glue balance described in this article, for instance, has been in use in our woodshop for two years. It was designed and built by Alphonse Karolek.

The glue balance in use

A balance of this type is easily made in the shop, and should discourage the practice of just guessing at glue and water proportions when preparing glue for the school shop.

To use it, place any amount of glue in one of the cans, and pour water into the other can until it is brought to a balance. Then the water is poured into a soaking vessel, the can returned to its place, and water is again poured into it until the scale is brought to a balance a second time. Then this second quantity of water also is added to that already in the soaking vessel, the glue is dropped in to soak until it is ready for the glue pot.

This method automatically fixes that two parts of water by weight be used with one part of glue, the generally accepted ratio for school use.

THUMBNAIL PLANE FOR MODELMAKERS

Clarence D. Schelleng, Supervisor of Industrial Arts, Junior-Senior High School, Oneonta, New York

In selecting projects for students it is sometimes difficult to find those that will give the maximum of returns in interest and in number of manipulative operations, without getting into difficulties that are too great, because the projects are beyond the skill of the boys or the capacities or school-shop equipment.

The little cast-aluminum plane here described makes a valuable general-shop project from many angles. It is interesting to the students; uses very little material; requires a number of different activities, i.e., pattern-making, molding, coremaking, machine and bench work, and it can be fitted to the most meager equipment. As the project may be made in a variety of sizes and shapes, some students may wish to add individual design to the other activities.

With care, the block for the plane can be cast without the use of cores, but since this requires a more delicate pattern and one which is more difficult to withdraw from the sand, we have found it more satisfactory to use cores. The cores also have the advantage of providing further instructional opportunities for the teacher.

Figure 1 shows an assembled view of the plane, and Figure 2 shows an assembled section and top view.

The thumbnail plane

The Pattern

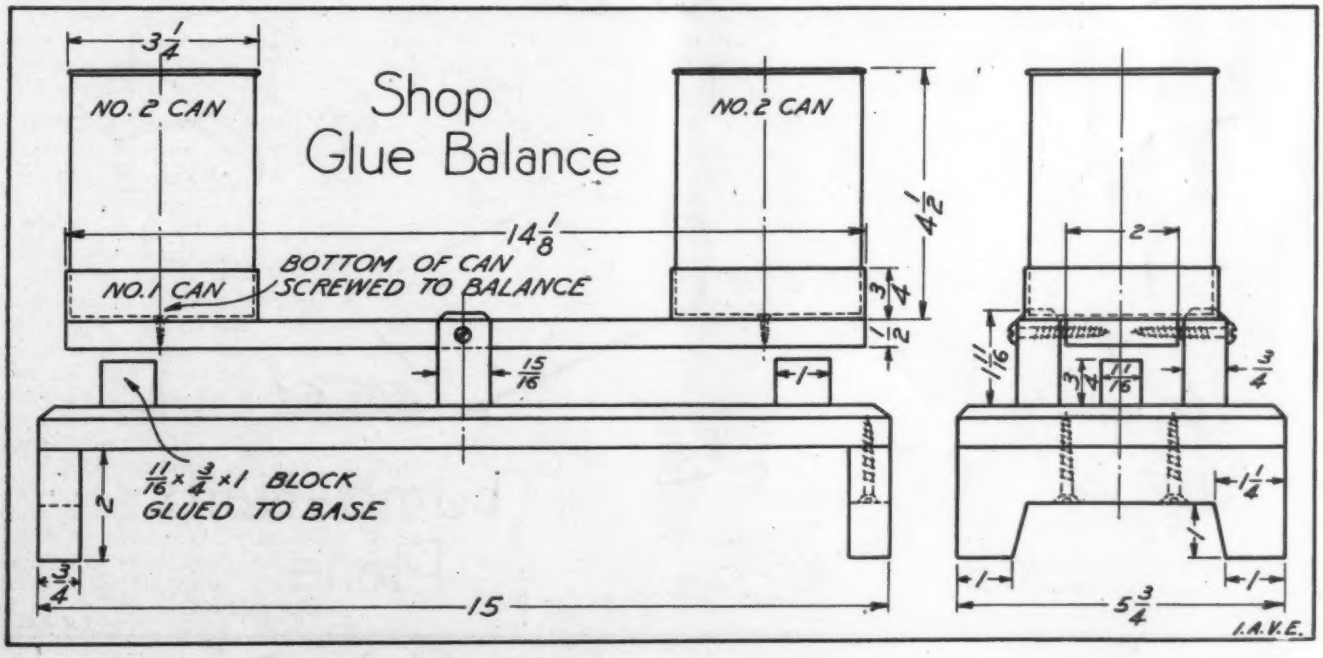
Lay out on a piece of pattern wood as shown in Figure 4.

Cut a 5/16 by 9/16 in. groove in the wood from end to end as shown. This is for insertion of the larger core print, Figure 5.

Saw out the pattern, and with a sharp plane give draft to the pattern, tapering from the sole of the plane to the top. This taper should be very slight.

Glue the core print securely in place. See Figure 5.

Smooth the pattern and shellac it.



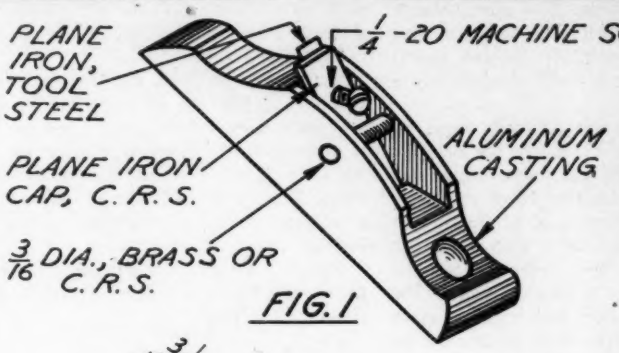


FIG. 1

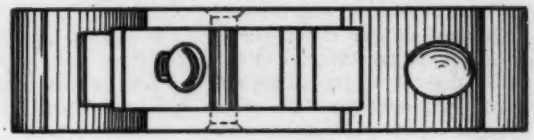


FIG. 2

THE PLANE

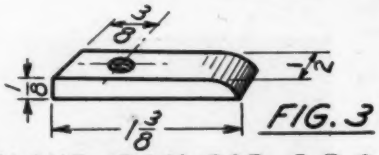


FIG. 3

PLANE IRON CAP, C.R.S.
DRILL & TAP 1/4 -20

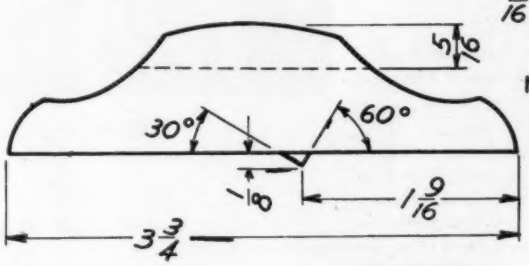
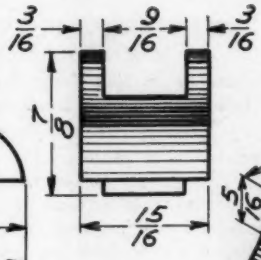


FIG. 4

THE PATTERN



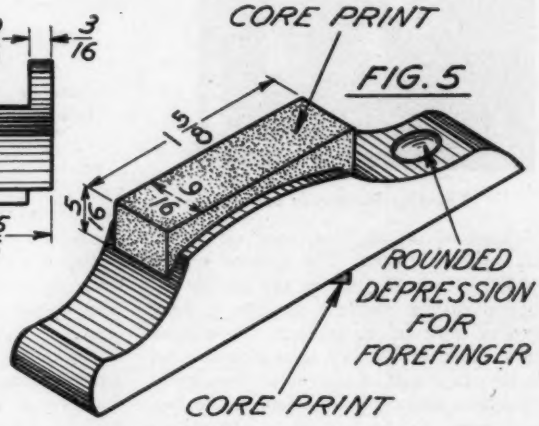


FIG. 5

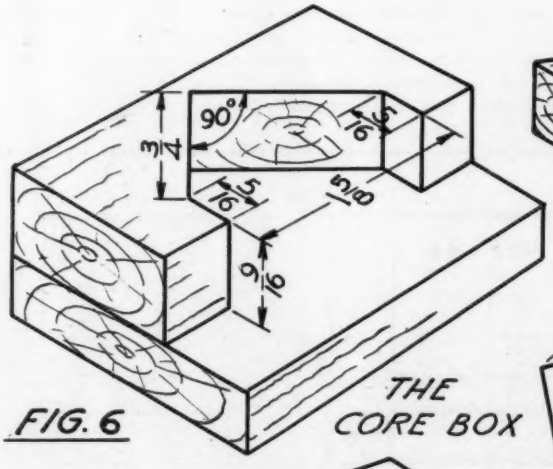


FIG. 6

THE CORE BOX

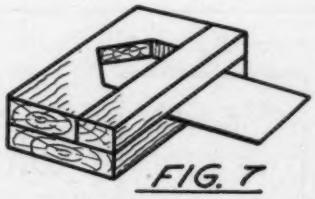


FIG. 7

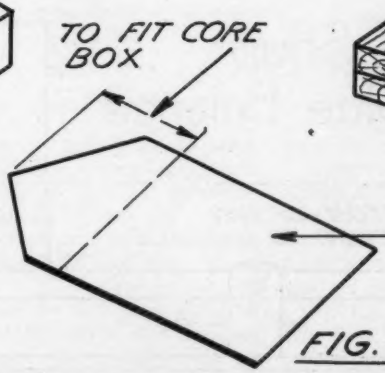


FIG. 6A

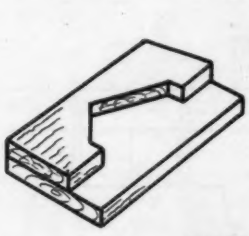
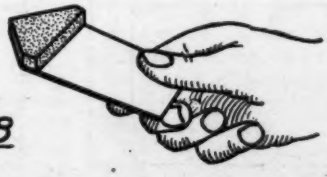


FIG. 8



Thumb-Nail Plane

I.A.V.E.

The Core Box

Select a piece of material 9/16 by 3 by 4 in. and see that the surface is true and smooth. Lay out the shape of the core on the surface as shown in Figure 6.

Cut the piece out and fasten it to another piece of flat stock 1 in. wider. See Figure 6.

Cut another piece 9/16 by 1 by 4 in. This makes a removable front to the core box and need not be fastened as it can be held manually while the box is being filled with core sand. Removing this loose piece provides a convenient way of removing the cores.

Removal of the cores is further facilitated if some thin pieces of sheet metal are cut to the shape of the bottom of the core box as shown in Figures 6*a*, 7, and 8. The cores may then be baked on these pieces of sheet metal.

The Plane-Iron Cap

The plane-iron cap is made to dimensions as shown in Figure 3. This may be made of either ⅛ by ½ in. mild steel, or of cold-rolled steel, or of hard brass.

The ¼ in. 20 by ½ in. r.h. machine screw used as a setscrew in the throat plate should be chucked and filed round on the end.

The Plane Iron

Ordinary hack-saw blades, power hack-saw blades, old hand saws, or band-saw blades may be used for the plane iron.

The blade is cut and the edge ground to a proper angle to provide clearance. This will vary according to the angle at which the blade is set in the plane.

Notes on Finishing the Casting

After the casting is made, it may be finished either by hand or with machinery.

The casting should be touched up with a file or fine rasp where necessary.

The sole is preferably faced off in a lathe by mounting in chuck or on faceplate.

Before finishing the sides the ¼-in. hole should be drilled to receive the round brass or steel rod which holds the plane iron and cap in place. The hole should be countersunk on both ends and the rod riveted in place.

The sides may then be faced in the lathe, or by holding them against an emery disk. They may also be finished at the bench with file, rasp, and emery cloth.

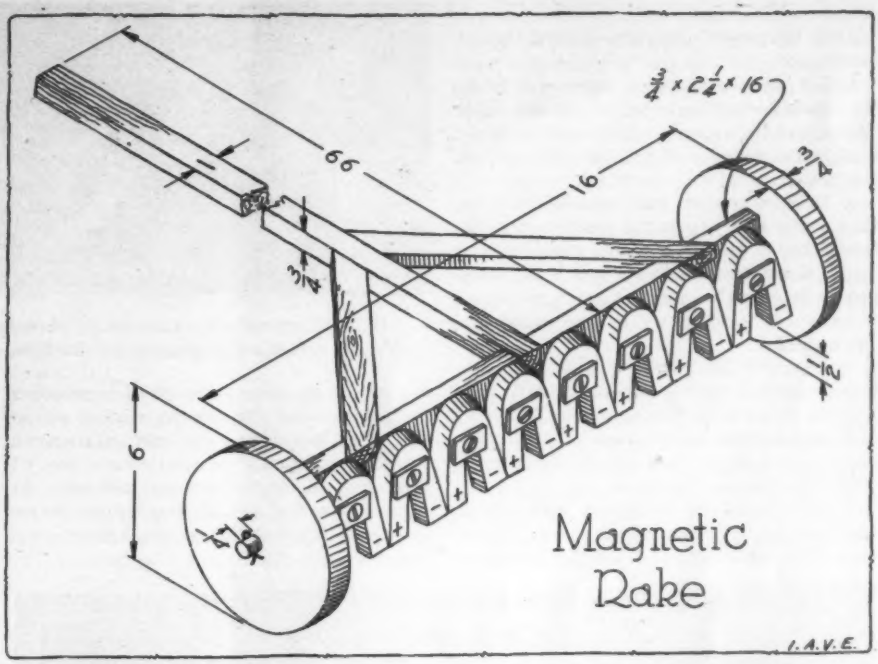
A PERMANENT MAGNET RAKE

Herbert C. Phelan,
Pine Manual Training School,
Ansonia, Connecticut

The rake described herein has been found invaluable in clearing the grounds around the building that houses the automotive-service laboratories of nails, bits of metals, and odds and ends of junk which drop on the ground and eventually become lodged in the treads of tires and cause punctures. The use of the common type of rake has been found very unsatisfactory in removing this type of material from the ground.

In discarding some old model T Ford engines, the flywheels were removed from the crankshafts and the permanent V-shaped magnets were stored away for future use. As an experiment, these were used on the rake shown in the illustration. It was constructed of pine by the woodworking department.

The handle, ¾ by 1 by 66 in. is fastened to the ¾ by 2¼ by 16 in. cross bar, to which in turn is fastened the 5/16-in. cold-rolled axle (formerly a radiator brace rod) which supports the 6 by ¾ in. pine wheels. These are held on the axle by two ⅛ by 1 in. cotter pins. The two ¾ by 1 in. braces were placed at a 45-deg. angle to take up the side thrust.



The magnets are evenly spaced and properly arranged according to magnetic polarity. They are fastened in place with brass machine bolts and flat brass retainer plates at a height of ½ in. from the ground. The axle may be fastened to the cross bar in any convenient way.

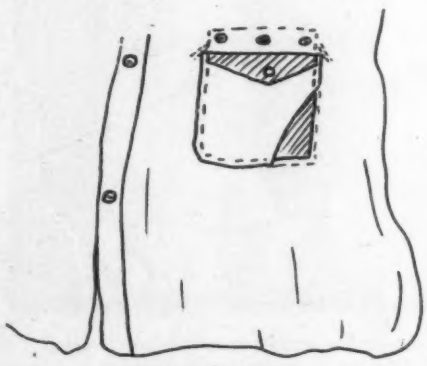
The first time this rake was used, more than a pound of nails, tacks, pins, nuts, and other metallic objects was collected.

It is a very good idea to go over the ground first with a common rake to remove stones and other obstructions that might loosen the magnets, and weaken the magnetic lift or pull.

LEATHER POCKET INSERT SAVES WORN SHOP-COAT POCKETS

Lorne R. Lauder,
Gooding, Idaho

Very often the pockets of a shop coat wear out, or become full of holes, long before the rest of the coat because of the tools one carries in them. A soft-leather pocket may be made with a front and back flap. The front flap is cut in a V shape with a snap in front to hold it to the pocket. By cutting a slit in the coat across the top of the pocket, the rear flap of the leather may be inserted under the slit and snapped to the inner side of the coat, thus giving free access to the leather pocket without interfering edges. The upper raw edge of the slit may be hemmed and the ends of the slit may be double sewed or otherwise reinforced to prevent ripping the coat. Any type of snap used in leather work will fill the bill. Pockets may also be reinforced with heavy cloth.



Leather pocket insert

THE SILK-SCREEN PROCESS

Lewis H. Hodges, High School,
Fremont, Michigan

Although the silk-screen stencil process has been used for many years in the commercial-art field it has been only recently that the industrial-arts teacher has taken advantage of its possibilities. The silk-screen process is an excellent method of decorating, not only posters, signs, and Christmas cards, but toys, plaques, lawn ornaments, as well! Practically any project that is decorated, and is wanted in quantities, may be produced by this process.

There are many types of stencils for this process; from the ordinary paper cut stencil (which is to be described in this article) to the elaborate, present-day, sensitized film stencil, which will duplicate photos and the finest print. There are approximately 130 different methods of making silk-screen stencils.

The construction and use of the tools necessary for this process, were adequately described on pages 27 and 28 of the January, 1937, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

The paper cut stencil is probably the most adaptable to school purposes, because a cheap grade of organdie cloth may be substituted for the more expensive process silk.

Method of Procedure:

After the proper equipment is purchased or constructed:

1. Cut sheet of wrapping paper as large as the outside dimensions of the frame. The thickness of the paper will determine the thickness of the deposits of process paint left on the article.

2. Draw or transfer the outline of the stencil on this sheet in proper position. Usually it is placed in the center of the sheet.

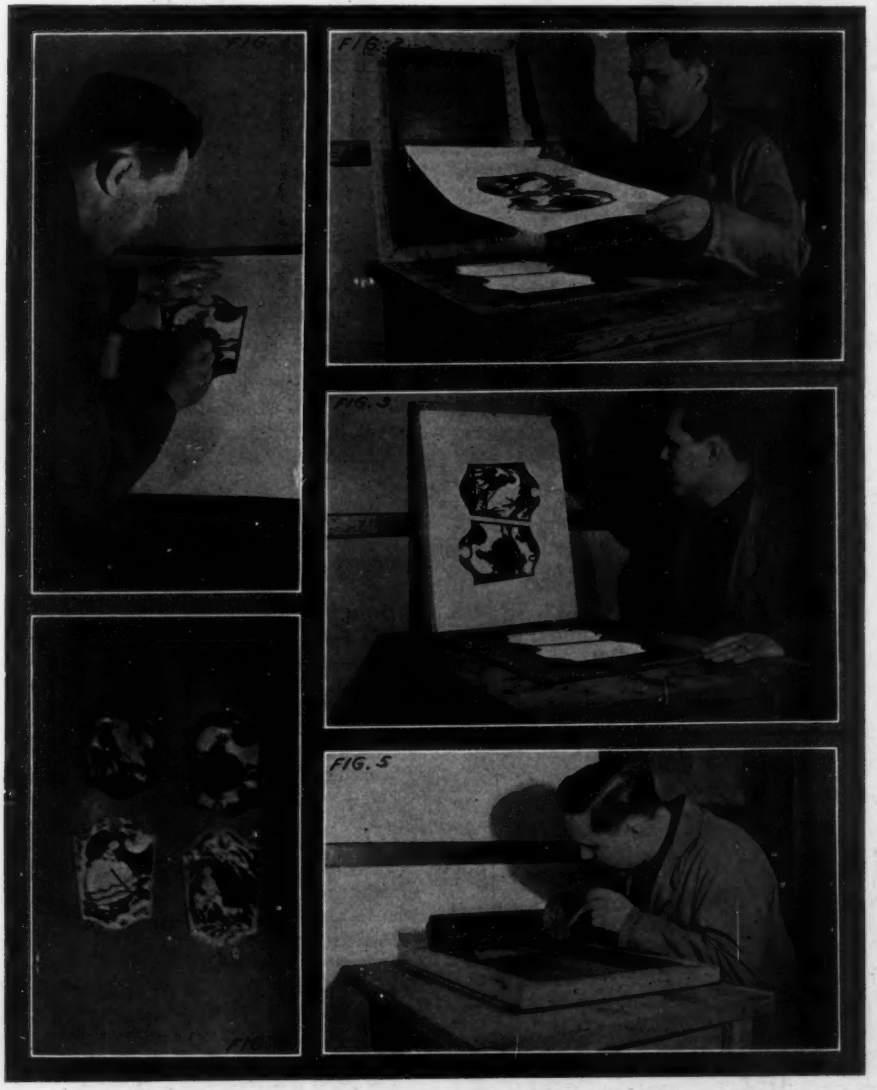
3. Cut the stencil with a stencil knife, sharp pen knife or with a safety razor blade. Keep in mind that the paint will be pressed through the openings.

In Figure 1, the portion that is to be left intact was colored black simply for the purpose of clearness in photographing.

All loose pieces are numbered so that they can be arranged in their proper places when stencil is affixed to the screen.

4. Lay stencil on baseboard and arrange loose pieces in proper places. This is illustrated in Figure 2. In this case the baseboard is made of the same thickness of plywood as the plaques, and the recesses are cut out so that when the plaques are inserted a smooth surface is presented to the screen. The recesses are cut on the jig saw, and then the outline is marked on the stencil paper before the stencil is cut so that proper registration is assured.

9th-grade general-shop students of Fremont High School, Fremont, Mich., processing, by silk screen, wall plaques for Christmas gifts. Also posters made by same process



1. Cutting the stencil. 2. Placing the stencil on the baseboard. 3. The stencil attached to the screen. 4. The trial run. 5. Pouring on the process paint

5. Place the screen and frame on the stencil with care, so that loose pieces are not moved. See Figures 2 and 3. The plaques are previously painted with two coats of flat white paint and sanded with No. 3/0 sandpaper. The process paint used was black, but this may be reversed, using a black-paint as a base and white process paint as shown in Figure 5.

6. Pour process paint across one end of frame. In Figure 5 the squeegee is in place at the end of the frame.

7. Draw the paint across the screen with the rubber squeegee, using sufficient pressure to squeeze the paint through the mesh of the screen. The first trial run will make the stencil and loose pieces adhere to the screen, as shown in Figure 4, where the stencil is shown with the blank plaques in place ready for the second run. This process is continued until all plaques have been printed. Speed is necessary to prevent clogging of the screen.

After the process paint has dried, coat the entire plaque with a thin coat of white shellac.

DIAGNOSING AND ELIMINATING MOTOR TROUBLES

C. S. Siskind, Purdue University, Lafayette, Indiana

Man has never been able to build a machine that will *not* wear out; nor is it likely that he ever will. Whenever parts move with respect to each other as they do when energy of one form is converted into energy of another form, a wearing action always takes place. In an electrical motor, electrical energy is converted into mechanical energy, i.e., electricity is sent into the copper wires in a motor, which, turning, drives some machine or device mechanically. In addition to this, the current, passing through the wires, produces *heat*, for this is *always* one of the important effects of electric currents. If the heat is dissipated, i.e., conducted away, as fast as it is produced, the temperature of the machine reaches some definite reasonable value, and no damage can result from this effect. If, on the other hand, heat is produced at a greater rate than it can be got rid of, the temperature continues to rise until some part of the machine burns out. It is obvious then that electrical machines must first of all be properly ventilated if they are to function satisfactorily. In the second place, motors must not be overloaded for long periods of time because such practice means that excess current will flow to the motor, thereby producing greater heating than the

ventilating facilities of the machine can handle. And in the third place it is essential that all electrical connections must be good and tight, because loose joints not only produce heat and waste energy but may cause the motor to burn out. Remember that loose electrical connections *anywhere* are always fire hazards.

Bearings. Of all the known causes of motor failures, and there certainly are many of them, the one to which the greater number are directly traceable is bearing trouble. All rotating parts of machines must be mounted in bearings either of the bronze-bushing type or the ball type, and provision is always made for oiling them at periodic intervals. One of the simplest jobs which even an inexperienced person can do easily to forestall the most common source of motor trouble, is to lubricate the bearings regularly, although for some unknown reason this is precisely the thing so many of us either forget or ignore.

Strange as it may seem, the machines which must take the most abuse and suffer the greatest pounding are not those powerful motors found in large manufacturing plants, steel mills, coal mines, pumping stations and the like, but the small devices used day after day in our homes and offices. Expensive heavy equipment is treated with consideration often not given even to human beings; it is carefully "nursed" by men who do nothing but see that all bearing surfaces are properly lubricated. And in addition, these Titans are equipped with automatic oiling systems, force-feed lubricators, oil coolers, and purifiers. But even these mechanisms are not trusted implicitly for other automatic "gadgets" will shut a motor down completely if, for some reason or other, the temperature of the bearings or windings should become excessive. Contrast this with conditions encountered by the small motor-driven devices. How often does the office girl oil her calculator, the soda-fountain clerk his malted-milk mixer, the housewife her washing-machine motor or food mixer? Probably the idea seldom occurs to them. It is plain then, that these small motors must operate under conditions which would soon ruin larger machines.

Grounds and Short and Open Circuits. Now, let us consider briefly some of the more common types of *electrical* troubles which may cause motors to get hot, lose power and, perhaps, burn out. Grounds come first. These are accidental direct metallic connections between any part of the copper windings and the iron frame. Before new motors leave the factory they are usually subjected to a very high voltage-insulation test. If, however, the motor is roughly handled, the insulation may become damaged and a ground may result. It is then that people coming in contact with the frame get shocks, which at times may even prove fatal. Whenever multiple grounds occur, the following symptoms usually appear: The motor may operate at reduced speed when carrying normal load; upon starting the motor may cause the fuses to blow; the machine may become unusually noisy during operation; if there is a commutator on the armature, it will spark badly at the brushes, and finally the motor will become very hot and, unless the trouble is located and corrected, will eventually cause the motor to burn out.

When the insulation on two or more wires fails so that a metallic contact exists at the place of failure, then we say there is a short circuit. This source of trouble will usually manifest itself by acting in exactly the same way as the grounded motor just discussed. If only a small portion of the winding, such as one coil, is shorted, it will get very hot and may even smoke. On commutator motors, it is sometimes possible to locate defective coils by observing which segments have become very dark in color. A short-circuited motor does not operate long in this condition because the damage caused by the defect is quick and certain.

Another type of defect is the open circuit. This is a definite break or a very loose connection some place in the motor winding, or, if there is a commutator, at one or more of the soldered connections where the coil ends join the segments. With this source of trouble, it is possible for a number of difficulties to result. Sometimes a motor will fail to start when the armature is stopped in certain positions, acting as though there were a number of *dead centers*. Under excessive load, the fuses may blow, indicating, of course, that the motor is drawing considerable current. Often an open-circuited motor will produce a humming sound as soon as the switch is closed and it will be observed that it gains normal speed quite slowly. If there is a commutator on the armature, it will be observed that the mica between the segments nearest the defective coil will become burned, while, during operation, the sparking may be vicious purple in color sometimes flashing completely around the entire circumference.

Faulty Installation. When motors are installed in some permanent location to drive a mechanical device, it is always important to see that both shafts are lined up properly. This is particularly true when the shafts are coupled or geared together. The writer has observed many cases where machines were not accurately installed, and in a number of such installations, the motors were carrying full loads even before the devices were doing any mechanical work.

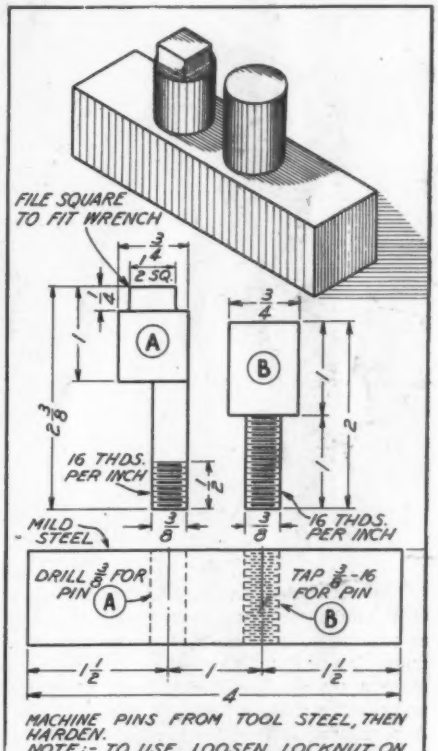
Locating trouble in motors requires that the electrical expert have a thorough understanding of the principles of operation of the many types of motors, a knowledge of the many testing devices and methods employed, an unusually large amount of experience in the field of *trouble-shooting* and a sort of peculiar ability *to see everything at a glance*. Good *trouble men* are always in demand because they are scarce. This branch of the electrical industry is exceedingly interesting because each case of trouble seems to be different and must be diagnosed upon its own merits.

The following suggestions are given in the hope that they may be helpful to those interested in this problem of locating and correcting defects in electrical machines. First of all find out the facts. See the thing itself; be sure that you, and you yourself see the way in which the motor acts. Do not accept somebody else's diagnosis because your conclusions should be based entirely upon your own observations. Record, on paper, in some logical manner everything you see, noting down the minutest details. When tests are made, be sure to use reliable instruments with which you are entirely familiar. After this, it is a good plan to list what you think are all the possible causes of the trouble. Often an investigator's difficulty arises from his neglecting to take some measurement which is the key to the situation. After you are sure your field of work is done, proceed to sift your observations carefully before diagnosing the trouble. Above all, follow a sound scientific method of procedure.

ADJUSTABLE BENDING JIG

Stanley Bowen, High School, Salem, New Jersey

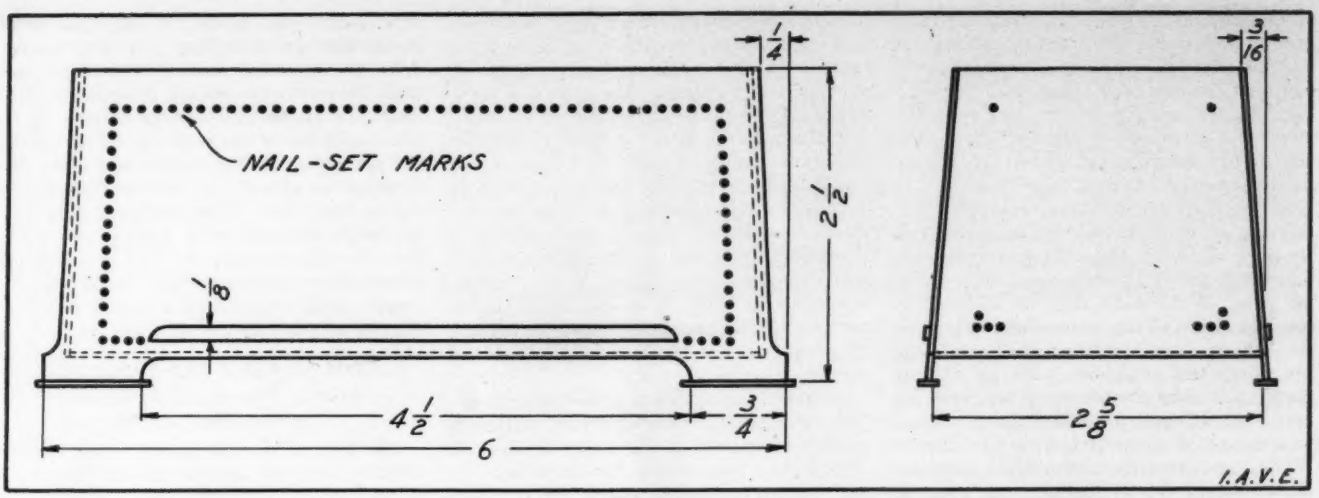
The style of bending jig illustrated here is a variation of the familiar bending fork commonly used. Its advantage lies in the fact that it is quickly and easily adapted to various thicknesses of material. The pins are made of tool steel. Mild-steel pins may be used, but they are not as durable, unless they are casehardened.



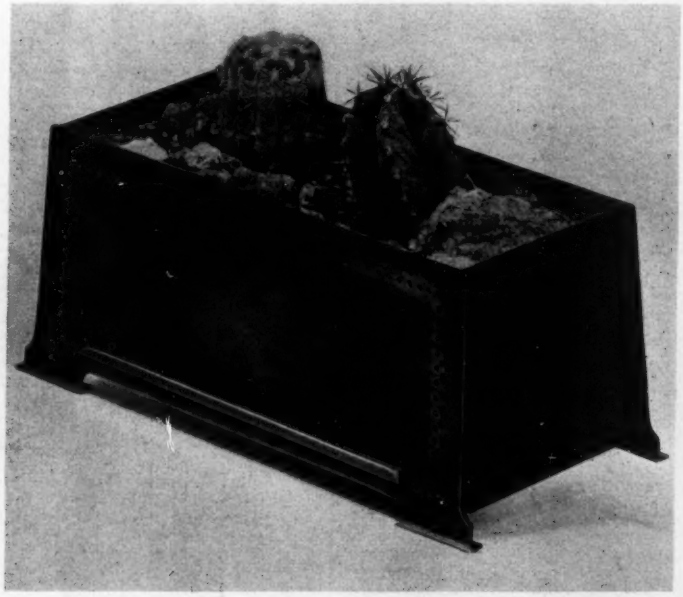
COPPER FLOWER BOX

S. H. Puehler, Public Schools, Milwaukee, Wisconsin

While the flower box described herein may be made of one of several kinds of metals, or the combination of two or more metals, copper or brass are found to be desired by the majority. The material should be at least 16 gauge in thickness and reasonably stiff and straight.



Copper flower box



The size of the parts may be drawn directly on the metal, or a paper pattern may be used as a template. If an entire class is to make the same size project, it would be advisable to make a tin or sheet-iron pattern. First, cut and file the various parts to shape and size. A pencil line is used for the location of the nail-set marks. These marks are used for decorational purposes only. Caution — hit the nail set with the hammer only one blow for each indentation. Next, coat the ⅛-in. strip of material with liquid solder and sweat onto the two sides. The ends are then soldered to the sides. The box is completed by the insertion of the bottom. Feet may be added in order to avoid marks by the sharp sides. Brass feet on a copper box add to the appearance.

For a finish, the natural metal will be chosen by many. If copper is used, it may be colored by the use of barium sulphide. A coating of lacquer or varnish should be applied in order to avoid tarnishing.

MODERN LACQUER FINISHES FOR THE SCHOOL SHOP WITH LIMITED EQUIPMENT

C. K. Lush, Assistant Director Industrial Arts, Public Schools, Minneapolis, Minnesota

Failure with lacquer finishes is due to follow if a working knowledge of its application is lacking. The process is entirely different from that used in painting.

Advantages of Lacquering over Painting

1. Easier to apply successfully.
2. Less expensive.
3. More educational advantages.
4. Increases value of the shop production.
5. It is a modern finish.
6. It advertises the school and department.
7. Less expensive and easier to work stock can be used.

Failure to accomplish the foregoing aims is simply due to lack of information about and experience with the process. All the equipment needed is the hand spray that can be purchased at very little expense.

The Process

Preparation

As in the painting or varnishing process, a good base is a prime essential to success. The project should be well sanded and all holes filled with plastic wood, water putty, or plaster of paris. Oil putty is not recommended. Projects may be made of the less expensive woods such as basswood, poplar, pine, or gumwood. These are easy to work, and appeal to the student. Most boys enjoy making large projects.

Prime Coat

Most lacquer manufacturers put out an undercoater or filler. These are best to use and should be thinned with the regular thinner. The brush may be allowed to dry out for it will soften readily when next used in the filler. This is a decided advantage over paint in brushes. Shellac is sometimes used as an undercoat but will flat bright colors. Flat paint, white or gray has been successfully used as an undercoater in absence of the lacquer product. The undercoater should be allowed to dry at least, 24 hours. It will appear dry in much less time but must be sanded with old fine sandpaper so that the rough will come off in fine dust. A coat of sealer may then be used. This consists of half clear lacquer and half thinner. This is not essential and is used only when a very smooth finish is desired. This sealer coat also should be sanded.

Brush Coat of Lacquer

For school purposes, the brush should be used as much as possible by the student because of the spray inconveniences. The first coat can be brushed on with little care because the spray will even it up later. A cheaper grade of lacquer of the same color may be used to cut down expense. Brushes for this are much easier to keep than are mussy paint and varnish brushes. One brush for each color hung above the container of the same color lacquer is a good practice. They will dry out but can be easily loosened in the lacquer. Lacquer dries by evaporation of the thinner; there is no physical change as in paints which dries by a chemical process.

After the lacquer coat has dried 24 hours, it may be sanded with No. 3/0 wet-or-dry sandpaper and gasoline. This is not essential but adds to the surface qualities.

Spraying

Any good hand spray will do. The bicycle-pump type is economical and may be successfully operated. More failures in lacquering have resulted from the spray itself than from any other cause. There are many seemingly minor points about sprays which must be observed to secure success.

1. See that the spray is thoroughly clean. Strain the lacquer through a cloth.

2. About one third thinner should cut down average lacquer to spraying qualities. This is important, for if the material goes on in heavy blotches, it is too heavy. If white spots appear and runs occur, it is too thin.

3. Regulate spray from coarse stream to fine. While making these adjustments, direct the spray into a container in order to save the lacquer, otherwise a great deal will be wasted.

4. Hold spray tip 6 to 8 in. from work. Practice will prevent runs. Spray back and forth from side to side and never hold spray upside down. The sprayed surface should be in a vertical position.

5. Use spray to even up brush marks, and don't try to put on too much at once. If runs appear, wipe off entire surface with lintless rag soaked in thinner.

6. Clean the spray by running 1 oz. of thinner through it. This may be sprayed directly in a container and saved for thinning darker colors. Keep nozzle in a tightly closed container.

Blending one color on another gives a pleasing effect if proper color schemes are followed. After a coat of Chinese red has dried, an artistic finish can be obtained by blending with the spray a fine coat of black along the edges. Other very popular color combinations are black on orange, black on jade green, deep blue on turquoise, olive green on canary yellow, and carmine on lavender.

Polishing

Clear lacquer and color lacquers can be rubbed to very fine surface by using the rubbing compound put out on the market under the trade name of Simonizing Cleaner. This is an abrasive and should be applied as per directions to prevent rubbing through. Any commercial polish for lacquers will finish the job.

Fumes

The fumes from sprayed lacquers are sometimes offensive. Ventilators can be easily made and installed at moderate expense. Success has been attained with the ventilator from over an old kitchen gas range and an electric fan. If a sheet-metal class is available such a ventilator can be made in the school shop.

Projects for Lacquering Adapted to School-Shop List

End tables
Smoking stands
Footstools
Wall racks
Book racks
Sewing cabinets
Ferneries
Magazine racks
Child tables and chairs
Clocks
Modernistic bookshelves
Airplanes

Suggested Finish Process for Magazine Rack Made of Basswood

1. *Brush on* prime coat of thinned undercoater or flat white paint.

2. Allow to dry overnight and sand with old fine sandpaper.

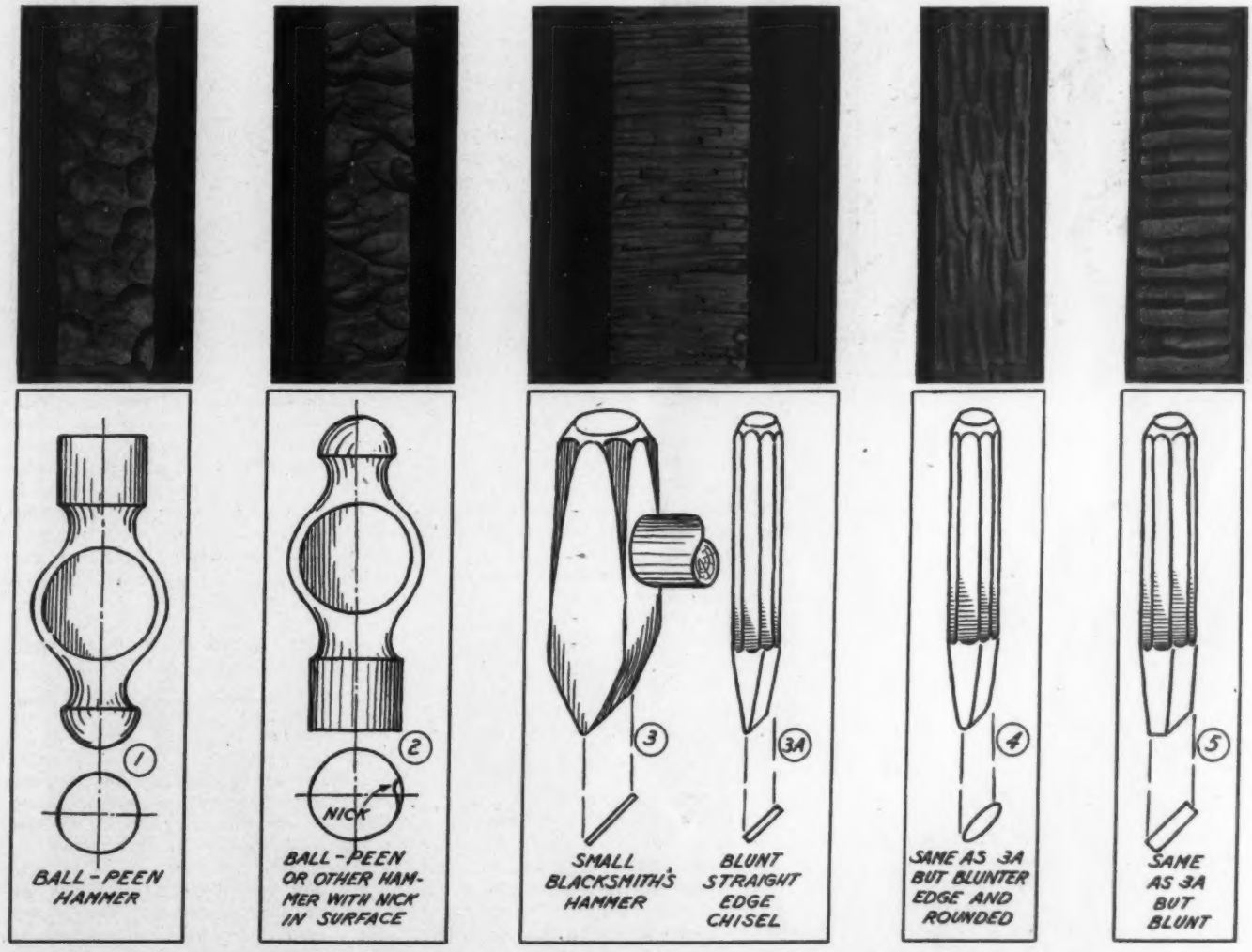


Fig. 1. Hand-hammered textures submitted by Douglas B. Hobbs, Pittsburgh, Pennsylvania

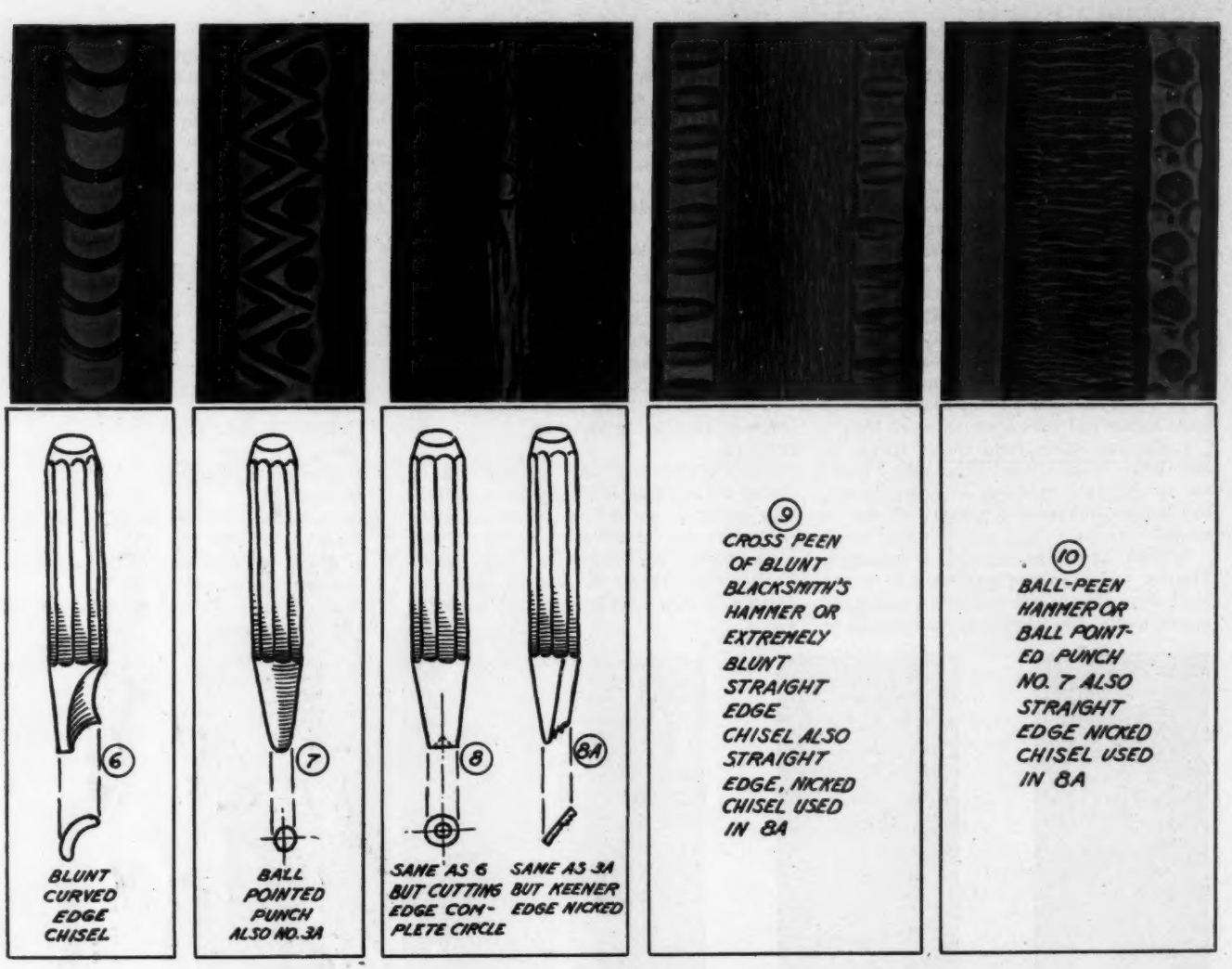

6
BLUNT CURVED EDGE CHISEL
7
BALL POINTED PUNCH ALSO NO. 3A
8
SAME AS 6 BUT CUTTING EDGE COMPLETE CIRCLE
8A
SAME AS 3A BUT KEENER EDGE NICKED
9
CROSS PEEN OF BLUNT BLACKSMITH'S HAMMER OR EXTREMELY BLUNT STRAIGHT EDGE CHISEL ALSO STRAIGHT EDGE, NICKED CHISEL USED IN 8A
10
BALL-PEEN HAMMER OR BALL POINTED PUNCH NO. 7 ALSO STRAIGHT EDGE NICKED CHISEL USED IN 8A

Fig. 2. Hand-hammered textures submitted by Douglas B. Hobbs, Pittsburgh, Pennsylvania

3. *Brush on* a coat of jade green of cheaper grade.

4. Allow to dry and sand with No. 3/0 sandpaper and gasoline.

5. Spray on one coat of high-grade jade-green lacquer and allow to dry.

6. Blend fine coat of black around edges of outer surfaces with spray.

7. Spray an appropriate design on front and back, with black lacquer through a stencil.

Don'ts

Don't try to brush one coat over the other unless the first coat has been allowed to dry for at least 24 hours. Lacquer dissolves lacquer and brushing must be done as rapidly as possible.

Don't allow *runs*.

Don't use alcohol for thinning lacquers for spraying.

Don't put the spray away without first cleaning it.

Don't strike matches or have an open flame near lacquer.

Don't neglect to follow the manufacturer's directions.

Educational Experiences of Lacquering

1. Preparing wood for finish.
2. Mixing prime coats.
3. Applying with brush.
4. Sanding with liquid.
5. Using air spray.
6. Choosing harmonizing colors.
7. Polishing lacquers.
8. Designing and cutting stencils.
9. Applying the modern furniture finish.

Related Topics for Class Reports Through Home and Library Assignments

1. The air gun in industry.
2. Automobile refinishing with lacquers.
3. Lacquers on metalwork.
4. Color harmony.
5. Mechanics of the spray.
6. The making of lacquers.
7. The making of sandpaper.
8. Cutting stencils and applying.
9. Applying transfers.

HAND-HAMMERED TEXTURES

Douglas B. Hobbs,
Pittsburgh, Pennsylvania

Occasionally, it is desirable to impart a hand-hammered texture to a wrought-metal article other than that actually developed in the course of fabrication. The accompanying illustration shows several different decorative effects that can be readily applied to wrought-aluminum objects with a hammer, or a tool and hammer. The specific tool required to produce the texture is shown graphically below each example. See Figures 1 and 2.

Other textures can be developed to suit individual preferences. An old hammer that has been chipped, or a cold chisel that has been nicked in one way or another should not be discarded, as they can be used to produce pleasing textures in wrought-metal articles.

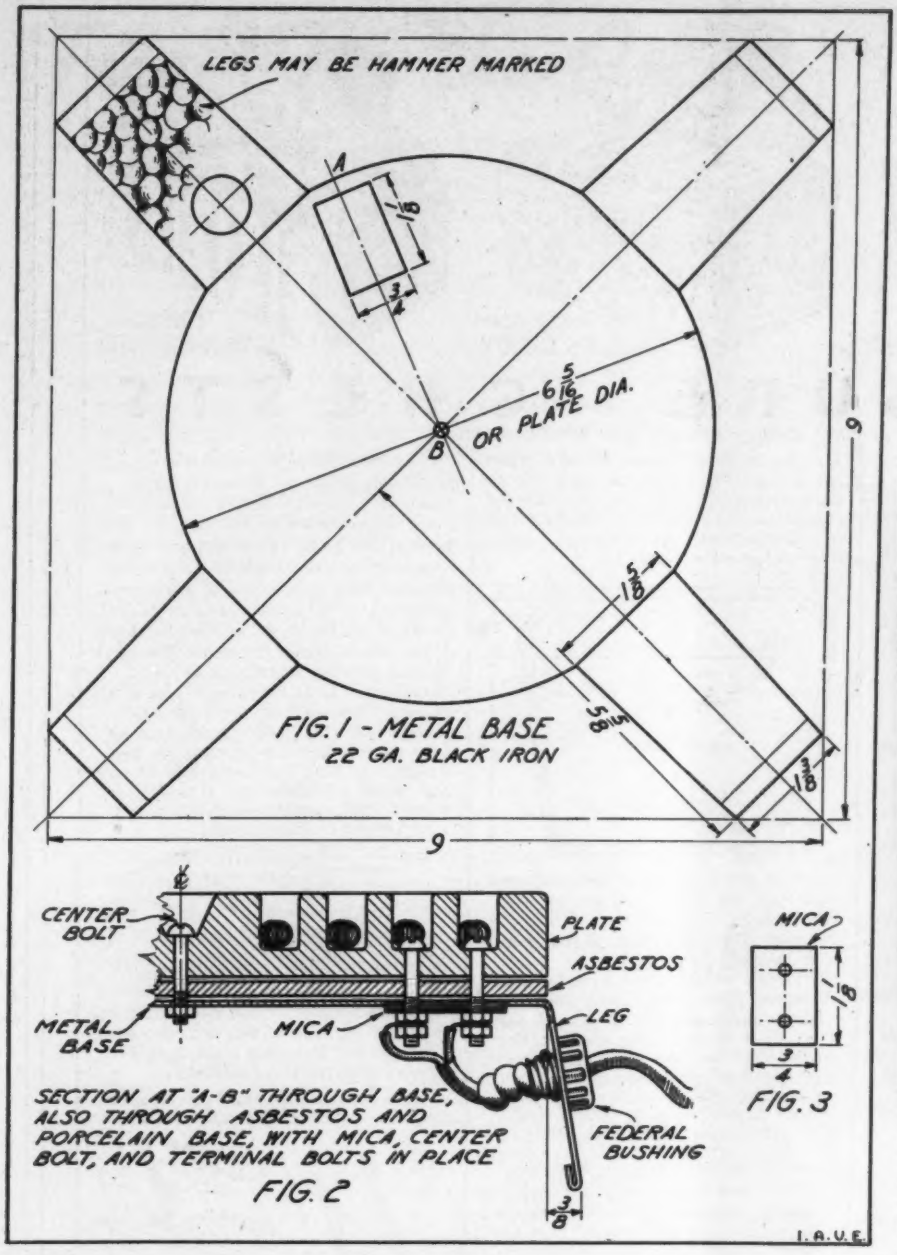
While aluminum has been used as an illustration, the textures given are applicable to other metals as well.

TO MAKE A 110-VOLT ELECTRIC PLATE

G. E. Engle, Ramsey Junior High School,
Minneapolis, Minnesota

Material:

1 Metal base, 9 by 9, 22-gauge black iron
1 Federal bushing, ¼ in., type A
1 Asbestos millboard, 6⅜ in. diameter, ⅛ in. thick
1 Porcelain brick plate, 6⅜ in. diameter
1 Center bolt, No. 10–25 by 1 in. r.h. machine screw
1 Washer
1 Hexagonal nut
2 Binding-post bolts, No. 8–32 by 1 in. r.h. brass machine screws



Electric plate

2 Washers
4 Nuts, hexagonal brass
1 Mica square, 1/16 by ¾ by 1⅛ in.
22 ft. Nichrome wire No. 20 B & S, .660 ohms per ft.
6 ft. No. 18 asbestos covered iron-cord wire
1 Attachment plug

Procedure:

1. Lay out metal base as in Figure 1.
2. Punch out ⅜-in. hole on leg for federal bushing.
3. Drill 3/16-in. center hole.
4. Cut out for square mica washer, size ¾ by 1⅛ in.

NOTE: The exact location for this, as well as the two binding-post holes in the mica, Figure 3, are determined by the style of the brick plate obtained.

5. Turn ¼ in. of material on the leg for a foot, as in Figure 2.
6. Bend legs down, as in Figure 2.
7. Cut asbestos millboard to the diameter of the plate, as shown in Figure 2.
8. Drill center hole and two holes for binding posts.
9. Wind nichrome wire into coil on winding jig, and make eyes on ends to fit binding-post bolts.
10. Lay heavy piece of cord or string in grooves of plate where heating element goes, from one binding post around to the other binding post. Use this length to get length of coiled nichrome wire.
11. Stretch out nichrome coil by pulling at ends only until the coil has the same length as the string has.
12. Assemble and put heating element in place.
13. Attach heater cord to binding posts.
14. Attach plug to other end of heater cord.
15. Ask instructor to inspect your work.
16. Plug in and test.

HANDY ATTACHMENT ON GRIPS AND SUITCASES

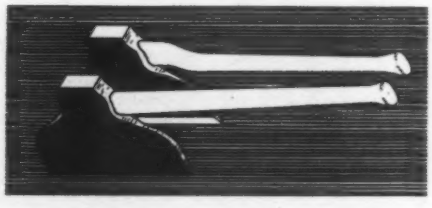
Frank Bentley, Clinton, Iowa

Students use their grips and suitcases mostly on short trips. It is the common practice to attach metal name tags for identification to the upper handle rings. When a number of these grips are stacked with other luggage, often of similar shape and color, it is hard to quickly pick out the right one. To obviate this trouble, take two small soft rubber sink

stoppers and cut off the ball-like projections on the lower side. Then cement one to each end of the grip or case as shown in the illustration. A good grade of the common workroom glue or cement will "put" them there to stay.

The small metal ring is very handy and convenient for any tag or identification slip and can always be plainly seen no matter how the grip may be placed or stacked.

HISTORY OF OUR TOOLS



The olden times left-hand-monkey-wrench joke was to reject the heavy broadaxe the boy brought because it had a crooked handle! E.M.Wyatt

PIRATE'S CHEST

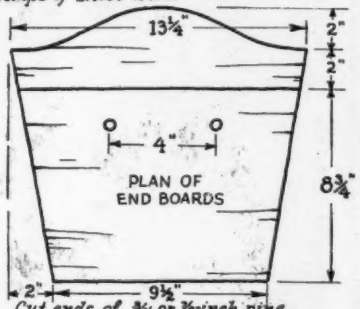
NORWEGIAN SAILOR'S CHEST

INDIAN PARFLESCHE

TREASURE CHESTS

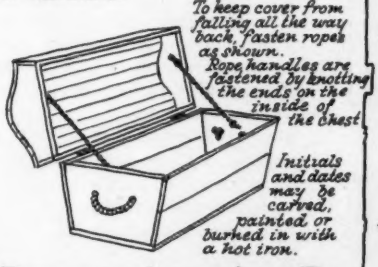
DESIGNED & DRAWN BY W. BEN. HUNT, HALES CORNERS, WIS.

Here we have a chest that no one will try to tamper with and in which you can keep your most cherished possessions. Make it of any soft wood and bind it as shown above with 1½ to 2-inch strips of sheet iron.



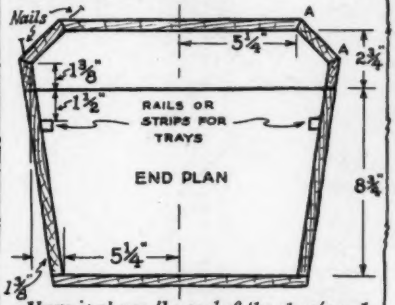
Cut ends of ¾ or ⅞-inch pine

The top is covered with 1½ to 2-inch strips. Plane edges to fit. Gluing the top strips together when nailing them to the ends will make a better job. Make the chest anywhere from 18 to 24 inches long. Use ¾-inch board for bottom. ½-inch boards may be used for the sides.


To keep cover from falling all the way back, fasten rope as shown.
Rope handles are fastened by knotting the ends on the inside of the chest
Initials and dates may be carved, painted or burned in with a hot iron.

Hinges are put on as shown. They should be narrower than the straps. On some old sea chests the straps were really elongated hinges. If black sheet iron is used for the straps, put hammer marks all over them to give them an antique appearance. Then shape them to fit snugly and mark where nails are to go. Take them off again and drill or punch the holes. Straps are then fastened with nails, clinched on the inside. Paint chest or finish with linseed oil.

This sea chest will make an ideal strong box, and will be a keepsake long after the days of scouting and camping. Painted in attractive colors, it will look as well in a living room as in camp. It will also serve as a stool.

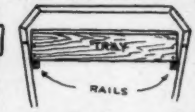


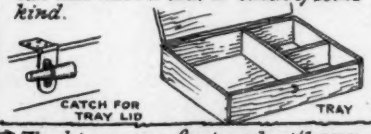
Above is shown the end of the chest and also how the boards are mitered at the corners, A. This chest should not be over 20 inches long. A steel chest-lock should be used.

Give the entire chest a coat of dull brick-red paint, inside and outside.

When that is dry, decorate with designs similar to those shown above, using black, blue and white paint. Do not use thick or glossy paint.

A sliding tray may be added in which to put smaller things, and if a hinged cover is fastened to it, it will prevent the contents from spilling when the chest is tipped. Make tray half the length of the chest. Rails should run the full length of the chest. The cover of the tray can also have a lock or catch of some kind.

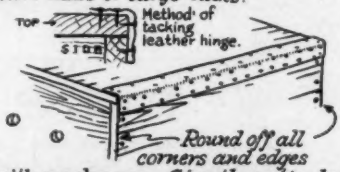




The hinges are fastened with screws before the straps are put on. The straps cover the hinges as shown.

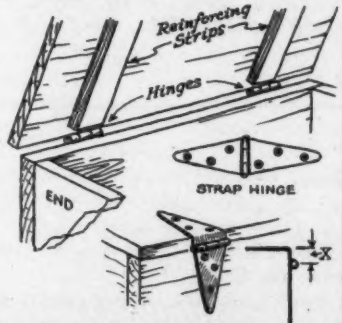
The sketch of the pirate's chest above shows how the hinge lock is made.

Par'flesche means rawhide, while par'flesche' means a rawhide box or container. Rawhide heavy enough for a par'flesche' is rather hard to get, but a box of the same appearance can be made of wood painted with Indian designs and symbols. Get a box measuring about 20 inches long by 12 inches wide and about 8 or 9 inches high. If you must build it yourself, use ½ inch lumber. Make a cover for it, reinforced with two strips placed 2 inches from each end. A strip of leather 1½ to 2 inches wide and as long as the box can be used for the hinges. If this leather hinge is kept soft with neats-foot oil it will last a good many years. Fasten it with short nails or large tacks.



with sandpaper. Give the entire box, inside & outside a coat of ivory paint. Then lay out designs with a soft pencil and paint as desired.

If iron hinges are used, place them over the cover strips as shown



Use strap hinges and bend one end as shown. Dimension X is the thickness of the top board. A simple lock like the one used on the Pirate's Chest can be added.

It may be well to add that when using a chest of any kind in camp, be sure to set it on blocks so that it does not rest right on the ground. It will last longer.

Free—For the Asking

DUTCH KRAFT Manual on Wood Finishing presents complete and practical information on Wood Finishing - - directs the use of correct finishes and insures projects well finished.

DUTCH KRAFT Wood Finishes, are the same as the materials used on highest type of furniture made in the factories of the Furniture Capitol of America and in Industry, wherever high quality Wood Finishes are used. These exact Wood Finishes are now available in convenient containers. The boys enrolled in Industrial Arts and Vocationa Education classes in all school shops have an opportunity of using these highly recommended, Master Craftsman Wood Finishing materials.

Send for your free copy of the DUTCH KRAFT Manual on Wood Finishing. This treatise on Wood Finishing is dedicated with this paramount thought in mind: 22 years of Research and Factory Experience + your application of our findings as set forth in this Manual on Wood Finishing = projects well finished, resulting in personal satisfaction of a task well done.

DUTCH KRAFT Wood Finishes for school shop use

DUTCH KRAFT Wood Finishes can be purchased in pints, quarts, half-gallons or gallons. For school use, however, these Finishes have been\ packaged in Kraftmans' Kits:

Kit No. 1

This Kit contains sufficient materials for finishing several projects by one boy.

Kit No. 2

Provides an assortment of finishing materials for projects made by several boys.

Kit No. 3

Contains larger sized portions of necessary materials and will provide the requirements for a group of fifteen to thirty boys.

Rich Mahoganies, Walnuts, Oaks, and Maples can be produced with the finishing materials in these kits as well as many other shades and colors. Because the same finishing material, in every container in either the No. 1, No. 2, or No. 3, Dutch Kraft Kraftsman's Kits, is the same finishing material which goes into making the finest finishes in Berkey & Gay, Robert W. Irwin, Grand Rapids Chair, Imperial Furniture, Gunn Furniture, American Seating Company, etc., etc. - - - furniture and finishes known the world over.

The latest type of period furniture today, with the same effects, can be reproduced by the proper application and use of DUTCH KRAFT Wood Finishes. DUTCH KRAFT Wood Finishes are identical - - - whether it be in drum lots to the furniture factories of the Furniture Capitol of America, or in pint or quart containers of the Nos. 1, 2, or 3 kit to the boys in the school shops. DUTCH KRAFT Wood Finishes plus the guidebook, "THE DUTCH KRAFT MANUAL ON WOOD FINISHING" gleaned from 22 years of Wood Finishing experience mean one thing and one thing alone—a project well FINISHED.

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Bring all of your wood finishing problems to us and let us prescribe the solution to these problems.

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There's A Quality STANLEY HAMMER *for Every School Shop*

Nail Hammer

Nail Hammer

Tinner's Riveting Hammer

Tinner's Setting Hammer

Machinist's Ball Pein Hammer

Whatever the shop — woodworking, plumbing, farm, forge, bricklaying, electrical, automotive, aircraft and metal — its needs are met by Stanley — the most complete hammer line available.

Heads are tempered by an exclusive process which strengthens the grain structure of the steel to its full potential. The straight grain hickory handles are oil treated, to prevent shrinkage and assure tight heads. These and other features equip Stanley Hammers for hard usage in school shops.

Catalog 34 gives full details on these and other Stanley Tools for school use.

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EDUCATIONAL DEPT.

New Britain, Conn.

STANLEY

Blacksmith's Hand Hammer

Machinist's Riveting Hammer

Trimmer's Tack Hammer

Auto Body and Fender Bumping Hammer

Bricklayer's Hammer

Personal News

PASSING OF RAY L. MARTIN

Ray L. Martin, director of industrial education for the state of Texas, died at Austin, on October 26. Death was due to a sudden heart attack.

Mr. Martin was a native of Texas. After graduating from the Fort Worth High School, he attended the A. and M. College, and the University of Texas. A special degree in industrial education was given him by the Colorado A. and M. College.

Previous to his entry into schoolwork, Mr. Martin conducted a machine shop in Fort Worth but was persuaded to teach machine-shop practice in the Vocational School, where he later became principal.

In September, 1930, he joined the staff of the extension division of the University of Texas. He became interested in training workers for the oil industry and was in charge of a number of foreman conferences. He prepared some useful texts on the subject for men in the oil fields. He was interested in safety problems and wrote a manual entitled, *Motor Vehicle Driving*.

In 1935, Mr. Martin was called to Washington to assist the Federal Board for Vocational Education in the organization of instructional manuals for the CCC camps. While a member of the extension staff, he taught at the University during the summer session.

In January, 1936, he was appointed State Director of Industrial Education. He had also served as chairman of the vocational division. Since that time he worked untiringly for the success of the state program, and his contribution to vocational education is immeasurable.

Mr. Martin had a likable personality which won him friends, and his life was an inspiration to all who worked with him.

¶ Mr. Louis V. Newkirk has been elected president of the Illinois Vocational Association. Mr. Newkirk is director of industrial arts and elementary science in the Chicago public schools.

¶ Mr. James Jenkins has been employed as vocational co-ordinator at Valparaiso, Ind. He will be in charge of a program of apprentice training and trade-extension work.

¶ Mr. Edwin Hume has been elected as instructor in woodworking in the senior high school at Greensboro, N. C.

¶ Mr. G. Q. Mathis, instructor in the Greensboro senior high school, has been elected supervisor of vocational training for the city schools.

¶ Mr. Charles S. Mills, formerly supervisor of vocational education at Greensboro, N. C., has resigned to become a job placement director with the TVA.

¶ Mr. C. C. Cooley, formerly instructor in industrial arts at Greensboro, N C., has been elected as supervisor for the Greensboro city schools.

Association News

¶ The Second Annual Industrial-Education Conference was held November 19 and 20, in Fort Smith, Ark. The industrial-education faculty of the Fort Smith schools acted as hosts. The initial meeting, a dinner program, attracted the leading instructors in the subject from the four states of Kansas, Missouri, Oklahoma, and Arkansas.

Dr. W. A. Brandenburg, president of the Kansas State Teachers' College, Pittsburg, was the principal speaker at the dinner, talking on "Some Important Phases of Teacher Education."

Mr. W. J. Breit, state industrial-education director, spoke on "The Industrial and Vocational Education Program of Arkansas."

Dr. W. T. Bawden, of the Kansas State Teachers' College, discussed "Methods of Instruction in the Industrial-Arts Shops," and Dr. O. A. Hankammer, professor in the Kansas College, talked on "Theories of Design and How to Teach It in the School Shop."

The Saturday program was opened with a tour, under the direction of Mr. Kenneth H. Clark, local instructor of industrial education, of the largest furniture factory in the city. Following the tour, a luncheon was held in the senior-high-school cafeteria. C. E. Paul, Muskogee, Okla., talked on "The Development of Industrial-Education in Muskogee." Following Mr. Paul, Harry E. Zook, of the Fall River, Kans., high school, spoke on "Judging the Physical Layout of the Shop." The closing address was on "Teaching Devices for Trade and Industrial Work," given by Mr. O. B. Badger, Tulsa, Okla.

Other conference speakers who presented phases of industrial education during the conference were Dr. R. L. Schwanz, of the Kansas Teachers' College; J. H. Moreau, director of industrial education, Little Rock; E. E. Hartnett, director of industrial education, North Little Rock; Mr. R. B. McHenry, director of industrial education, Fort Smith.

The luncheon was concluded with an inspection and tour through the junior- and senior-high-school shops and the part-time school. — *Kenneth H. Clark.*

(Continued on page 12A)

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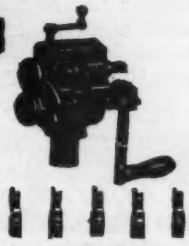
Foot Squaring Shears



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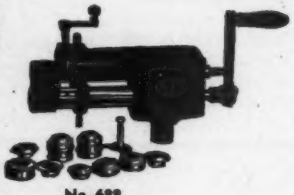
America's leading SPECIALISTS in SHEET METAL WORKING TOOLS and MACHINES

Many years experience in equipping school sheet metal working departments particularly fits us to help you secure the most practical and economical layout of your shop for a given course of instruction.

Pexto equipment and tools have been standard throughout the sheet metal industry for the past 118 years. You can furnish your shop complete in every detail from this one reliable source.

The bulletin offered below contains shop plans, equipment list for various types of schools, useful working diagrams and illustrations of various tools and machines. May we send you one or more copies?



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Deep Throat
Combination Machine

No. 0581
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No. 63
Adjustable Bar Folder with Counter Balance

Send for Our Complete, Revised SCHOOL SHOP PLAN-BOOK

An invaluable aid to instructor and student alike. Specially prepared for the use of trade and vocational schools.

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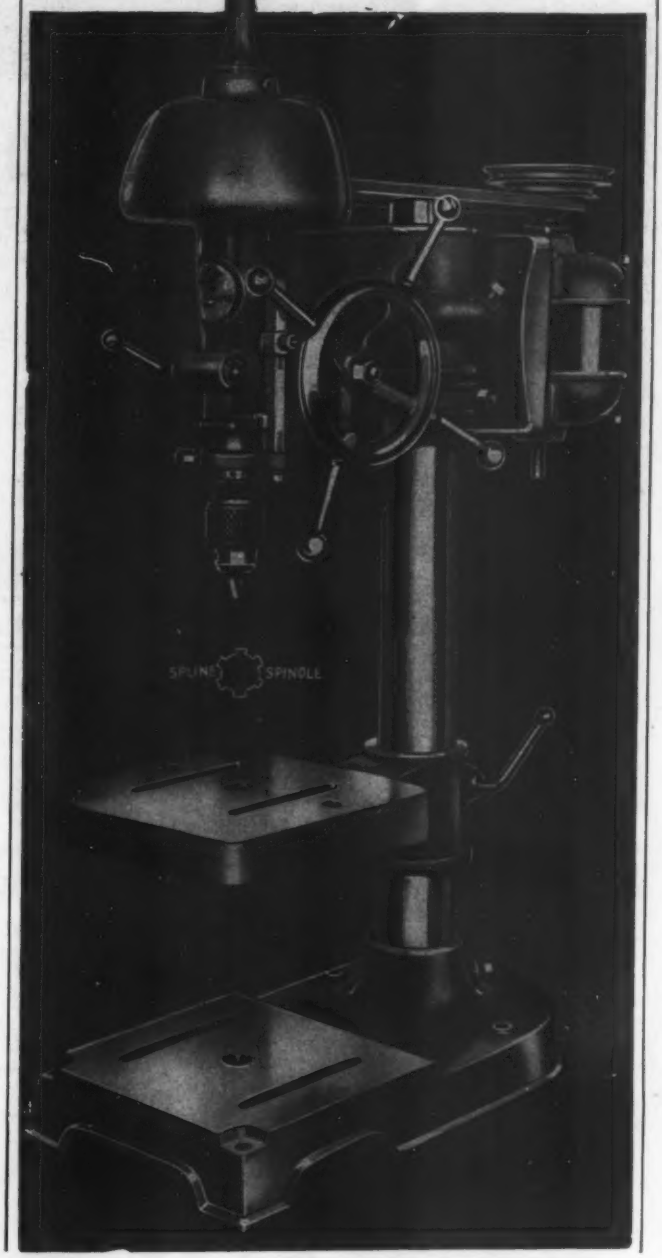
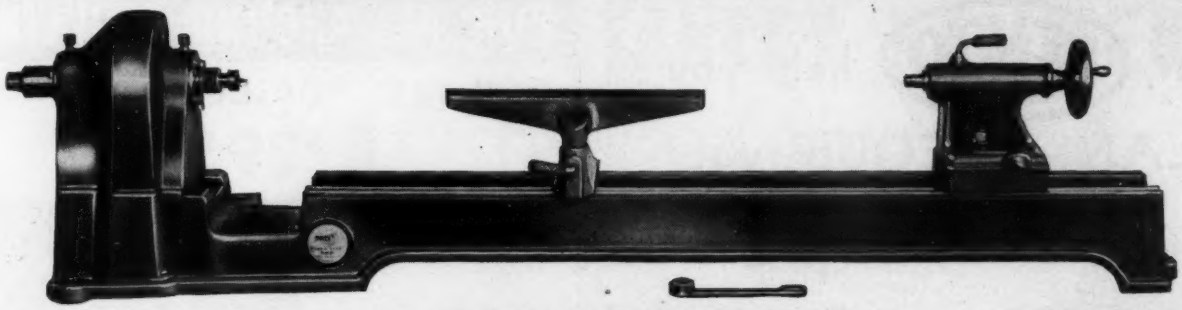
$39.95 (Including belt and motor pulley, less motor)



Six spline spindle. Pilot wheel lowers spindle 4", positive spring return. Table raises and lowers, swings to any position, tilts to any angle. Jacobs (0 to ½") key chuck. Rigid 2-¾" steel column. Four-speed pulleys. Four precision ball bearings.

Simple and safe for all kinds of drilling, plus mortising, dovetailing, carving, and shaping with attachments. See it at your dealer's or send for new 1938 catalog. Walker-Turner Co., Inc., 1918 Berckman Street, Plainfield, N. J.

WALKER-TURNER *Engineered* POWER TOOLS



POPULAR IN PERFORMANCE AND PRICE

L751 LATHE $34.65

(As shown, plus 39" heavy duty V-belt and box wrench)

A tool which has all the worthwhile features of much more expensive wood-turning lathes. Extra strong and rigid throughout.

Bed 54" long. Capacity of 37" between centers, 13-½" swing over gap, 10" swing over rest of bed. Hollow head spindle 1" in diameter mounted on two precision ball bearings, one with double row of balls, deep grooved for ample thrust capacity. Four speeds. Morse Taper centers.

This high value tool is built for years of wood-working shop service—and a complete line of Walker-Turner accessories is available to equip it for metal turning or spining. Ask your local dealer for a demonstration or write for 1938 catalog. Walker-Turner Co., 1918 Berckman Street, Plainfield, N.J.

WALKER-TURNER *Engineered* POWER TOOLS

(Continued from page 10A)

¶ The Illinois Industrial-Education Association, at its recent meeting, elected the following officers for the year:

President, L. V. NEWKIRK, Chicago; secretary, H. P. ERVIN, Sullivan; treasurer, ALLAN LAFLIN, Aurora.

¶ The Minnetonka Industrial-Arts Club in Minnesota, at its recent meeting, elected new officers for the year as follows: President, VICTOR JOHNSON, Wayzata; vice-president, D. T. BANNISTER, Robbinsdale, secretary-treasurer, RUSSELL S. FAWVER, Cambridge.

¶ Twenty-three honorary, associate, and regular memberships were presented by the Wayne University graduate chapter of Mu Sigma Pi, the honorary industrial-education fraternity, at a banquet at Dearborn Inn, on Saturday, November 6. More than 100 persons were in attendance.

In connection with the banquet, honorary membership was conferred on George H. Fern, State Director of Vocational Education for Michigan, and John J. Metz, Editor of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine, Milwaukee, Wis. Frank Cody, Superintendent of Schools, Detroit, Mich.; Henry Ford, William J. Scripps, and K. G. Smith accepted honorary memberships but were unable to attend.

Associate membership was extended to Norman Arthur, Dr. Verne C. Fryklund, Edward Holmes, Robert Lee Howard, Don S. McGuire, Otto R. Sieloff, E. C. Weaver, and H. J. Van Westrienen.

Dr. Meyers, professor of vocational education at the University of Michigan, presided at the banquet which followed the initiation ceremony. Mr. Bedell introduced the guests, among whom were principals and counselors of many of the Detroit schools.

A coat of arms, designed and executed in copper by Mr. Wylie of Denby High School, was accepted by the Fraternity, and President Schaal presented the graduate fraternity with a bronze replica of the key.

Dr. Frederick B. Fisher, Detroit, gave a talk on the Japanese situation, which revealed a keen analysis of the conflict and an experience based on his life in that part of the world. — *Leo J. Stawecki.*

Answers to Questions

VARNISH FOR VIOLIN MAKERS

1008. Q.: What is the *best* varnish and glue to use in violin making? — *O. L.*

A.: I am suggesting that you write to Lyon & Healey, Chicago, Ill., for these two materials. They can be relied upon to offer satisfactory goods. — *Ralph G. Waring.*

LIQUID PASTE FILLER

Q.: We have been using a liquid-paste wood filler and according to all filler practice, it should be wiped off when it becomes dull, but we have been unable to secure good results with this when we wipe it, as it is too sticky and "balls up." Is there some way to prevent this? — *J. B. M.*

A.: My guess is that your filler has too much oil and varnish in proportion to the silex and thinner, and that the latter has not been made of one part turps to two parts gasoline. It is not necessary to start work when the filler has flatted off, rather I like to start padding in with a smooth-faced pad of rags as soon as applied, thus forcing the filler into the pores and speeding up the work of final cleaning off across the grain. By this method all tendency to pulling out, or "balling up" as you term it is done away with. — *Ralph G. Waring.*

1014. Q.: Will you please refer me to any information available on the construction problem of placing battleship linoleum over a concrete slab on a gymnasium floor? — *M. V.*

A.: A lot of things can or may not influence the job. For instance, is the floor old and well cured, or new? If old, has it been oiled or waxed? In any case, it is of no use for me to write a specification for this job. It should be turned over to the representative of Armstrong or similar manufacturer, drawing up a *written guarantee of unconditional five years' service,* guaranteed by the *manufacturer.* This is by no means a job for the handyman of a department store. And well do I know it, after twenty-two years of specifying and supervising floor work of every kind and description. My own recommendation at this time, with the small amount of information available, is to seal the concrete with a mastic and then roll down the battleship linoleum which has been opened in a hot room and laid flat for at least three days before handling. This will produce a wave-free job which will endure the terrific pounding on gym floors and not creep or crawl as it is certain to do if any of the above steps are omitted. — *Ralph G. Waring.*

Encourage Student Efficiency with EFFICIENT FURNITURE

Metal Worker's Table No. N-3151

Students who are being trained for industry need particularly to learn the lesson of *efficiency*, for on this ladder men climb to success. It is therefore highly important that the equipment with which your students work shall be efficient in itself and thus encourage efficiency in those who work with it.

Educators whose judgment is sought in matters of modern equipment for vocational schools are quite unanimous in their approval of Kewaunee Furniture. This distinction has been earned not only by integrity of material and workmanship, but by Kewaunee's constant contact with practical educators everywhere.

Ever-Hold Adjustable Stool E-1824

Single Manual Training Bench No. N-3088

Glue and Stain Bench No. N-3154

Typical Installation of Wood Working Shop

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If you need one piece or carloads you should have in your files the Kewaunee Book for reference. It contains illustrations and details on the full Kewaunee Line. It is sent postpaid without cost to authorized purchasing agents. Write for your copy today — on your institution's letterhead.

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New Publications

Machine Woodworking

By Herman Hjorth. Cloth, 371 pages, 6 by 9, illustrated. Price, $3.25. Published by The Bruce Publishing Company, Milwaukee, Wis.

In this book the author presents the historical development of woodworking machinery, a description of the machines in common use today and directions for using them in actual practice. The machines have been divided according to type, thus under "Circular Saws" are descriptions of the universal saw and the variety saw, together with explanations covering the saw table, ripping fence, miter cut-off gauge, saw arbor, circle saw blade, guards, bench saw, straight-line rip saw, cut-off saws, double cut-off saws, radial saw, power hand saw, and universal woodworkers.

In the same way are treated band saws and jigsaws; planing and scraping machines; shapers and routers; mortisers, borers, and tenoners; wood-turning lathes; sanding machines; and glueroom machinery and equipment. There also is a chapter on "Installation and Maintenance." A set of questions for discussion are added to each chapter.

Printing in the Americas

By John Clyde Oswald. Cloth, 565 pages, 6⅝ by 9½, illustrated. Price, $7.50. Published by the Gregg Publishing Company, New York City.

This delightfully readable historical volume not only shows how important the printer was in the development of our own country, but also covers in the one volume a graphic presentation of the growth of the printing industry from its inception to the present day, in the United States, the provinces of Canada, Newfoundland, and the countries of Mexico and Central and South America.

Handicraft

By Lester Griswold. Craft edition, paper, $2.50; library edition, cloth, $3.50. Size 7½ by 5¼, 424 pages, illustrated. Published by the author at Colorado Springs, Colo.

This exceedingly comprehensive volume presents in concise form, simplified procedures and projects in leatherwork, celluloid, metalwork, woodwork, batik, rope, pottery, weaving, gem cutting and polishing, alabaster work, and Indian beadwork, featherwork, craftwork with horsehair, porcupine quills, and the like. It is well illustrated, and covers each one of the subjects quite fully.

Industrial Electricity and Wiring

By James A. Moyer and John F. Wostrel. Cloth, 502 pages, illustrated. Price, $2.75. Published by the McGraw-Hill Book Company, New York City.

This is the second edition of this text on electricity for light and power. In it are discussed the fundamental theory of electricity, splicing and soldering wires, the various types of wiring methods, wiring in conduits and moldings, wiring old buildings, industrial and house appliances, electric generators and generator wiring, motor and motor wiring, transformers and their connections, lighting, wiring for theater service, residential lighting, estimating, outdoor wiring, distribution systems, circuit control apparatus, grounding of systems, and wiring for miscellaneous service.

Plastics

By A. J. Lockery. Cloth, 228 pages, 5½ by 8½, illustrated. Price, $2.50. Published by the Governor Publishing Corporation, New York City.

In the book, designed for the school and home workshop, the author describes this new craft material, the special shapes in which it appears, its physical properties, color, and the like. He also describes the equipment required both in the way of hand and power tools for working the material, carving, cementing, bending, embossing, inlaying, and finishing. The book contains quite a large number of projects that can be readily made by the beginner and the advanced worker.

Electrical Occupations

By Lee M. Klinefelter. Cloth, 227 pages, 5⅜ by 7¾, illustrated. Price, $2. Published by E. P. Dutton & Co., Inc., New York City.

This represents a survey of the vocational opportunities for boys in the field of electricity. Much of it is written in the narrative form to make it more interesting to the youthful reader.

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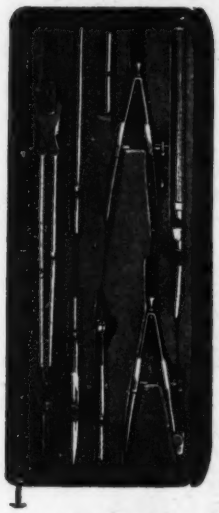

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News Notes

¶ A new course in the distributive occupations is being offered at Teachers College, Columbia University, beginning February 2, 1938. The course is intended to meet the needs of experienced teachers and also those employed in the distributive occupations who wish to prepare for teaching in these fields. It is expected that the course will help in meeting the demand for teachers, supervisors, and directors in these occupations.

¶ The Calco Chemical Company, Inc., Bound Brook, N. J., has announced its new film, "Beyond the Rainbow," which tells the story of the dye industry. It comprises six prints, in duplicating color on 16 mm. films, and is both educational and entertaining. It may be obtained by writing to the Motion Picture Laboratories of the Calco Chemical Company, Inc., at Bound Brook, N. J.

¶ A new department of printing and publishing has been opened at the Rochester Athenaeum and Mechanics Institute at Rochester, N. Y. A two-year course is being offered, including hand composition and typography, machine composition and maintenance, presswork, proofreading, copy writing, art and design, and other general courses.

Through its program of individual instruction, the department will offer training for the publishing and printing industries. The institute seeks to provide a means of self-education and to encourage the student to select educational work in harmony with his ambitions.

Members of the faculty are B. G. Culver, general supervisor and counselor, R. R. Karch, technical supervisor, John W. Baker, and Joseph Sorace.

¶ New evening classes in trade and industrial subjects have been established at Topeka, Kans. A blueprint reading class, a show-card writing class, and one in electrical theory have been opened. Mr. Kenneth Worsley is the instructor.

¶ New classes in sheet-metal work, steel square, electric refrigeration, machine-shop practice, show-card writing, welding, printing, and chemistry for nurses were established recently in Wichita, Kans.

¶ The new Department of Publishing and Printing, of the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., has begun an intensive study of the job duties of workers in the publishing and printing fields. The study is to form the basis for the content of courses to be offered. Mr. R. Randolph Karch, Technical Supervisor, and Dr. L. L. Jarvie, Chairman of the Research Committee of the Institute, are directing the study with Dr. W. W. Charters, Director of the Bureau of Educational Research, Ohio State University, acting in an advisory capacity. Thirty-eight specialized jobs in the commercial-printing area will be studied, and twenty-three in the publishing area.

¶ The Joseph Dixon Crucible Company, Jersey City, N. J., has announced its annual Eldorado-Scholastic Drawing Contest for 1937–38. A silver cup will be awarded to the school submitting the best group of pencil drawings. Full details concerning the contest and the awards may be obtained by writing to the Joseph Dixon Crucible Company at Jersey City, N. J.

¶ "A Short Wave Journey of Discovery" is the title of a booklet on the radio, prepared by Hendrik Villem Van Loon. The booklet of 32 pages, dramatizes the story and history of short-wave radio. It is published by the RCA Mfg. Company, Inc., of Camden, N. J.

¶ Announcement has been made of a civil-service examination to be held November 22 and 26 to fill the positions of purchasing officer, assistant purchasing officer, and junior purchasing officer in the treasury department, Washington, D. C. Appointment will be made on the basis of ratings given in tests and the salaries will range from $2,000 to $3,200 a year.

An apprenticeship training program has been introduced in the high school at Manistique, Mich. Mr. Lawrence L. Musser is the co-ordinator.

The State University at Baton Rouge, La., conducted a short course during August for the benefit of farmers. Short discussions were held on cattle, poultry, judging farm stock, care of crops, and control of diseases.

Enrollments in vocational technical schools in New York State continue to show steady increases. At the close of the last school year 14,136 students were enrolled in these courses. This is an increase of 8,565 students, or 165 per cent since 1929.

Since 1929, vocational technical courses have been established in Endicott, Brooklyn, Jamestown, Lockport, Niagara Falls, and Schenectady. Binghamton has added two technical courses which are given in a new building.

In addition, industrial and technical courses covering two years, have been established in four of the state schools of agriculture. The state school at Alfred is offering industrial electricity; the one at Canton, electricity; and the one at Delhi architecture and building construction.

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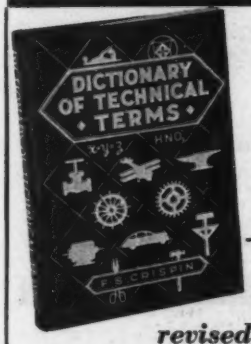

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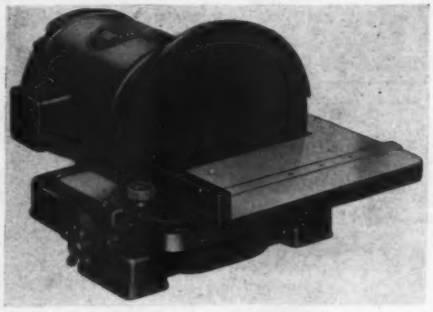

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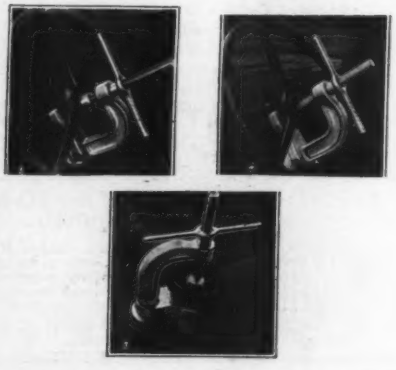

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(Continued on page 19A)

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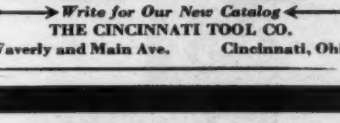

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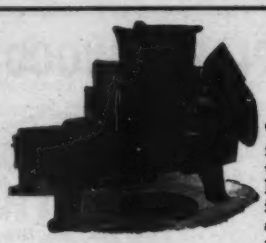

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The really complete Bench Furnace for shop and industrial use. Heats the largest soldering coppers and branding or stenciling irons. Also ideal for tempering, heat-treating, annealing, case-hardening, or soft metal melting. No blower or forced air blast required. Heating long rods or sweating joints is possible by opening side doors in the hood. Equipped with 22 lb. capacity (removable) melting pot. Fitted with three powerful Johnson Bunsen Burners each with shut-off valve and pilot light. Get full details on this famous Johnson Furnace.

Write for free catalog.

JOHNSON GAS APPLIANCE CO. Cedar Rapids IOWA

PATENTED!

The new tooth construction of Nicholson, Black Diamond and McCaffrey Files is an exclusive feature. The principle of controlled serrations . . . basis of the new patented tooth construction . . . brings to your students files which will not only enable them to do better work . . . but which will lower your file costs. Wholesalers can supply you. Nicholson File Company, Providence, R. I., U. S. A.

A FILE FOR EVERY PURPOSE

SAVE YOUR SAWS • HELP YOUR PUPILS

with the

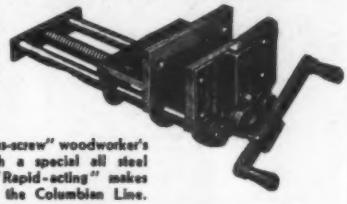
FOLEY AUTOMATIC SAW FILER

Sharpens all hand, circular, band and back saws. Keeps saws in perfect condition, enabling students to do better work. Easy to operate, eliminates all eye strain—students can sharpen their own saws while learning. Sold on 30-Day Trial. Write for further information.

Foley Manufacturing Company
18 Main Street N. E., Minneapolis, Minn.

COLUMBIAN VISES FOR BETTER SCHOOL SHOPS

The quality of workmanship and high standard of materials that go into all Columbian Vises assure the necessary high efficiency needed in today's modern school shops .. moreover, Columbian Vises are designed for a lifetime of satisfactory service.



Columbian "continuous-screw" woodworker's vise is equipped with a special all steel adjustable handle. "Rapid-acting" makes are also included in the Columbian Line.

THE COLUMBIAN VISE & MFG. CO.
"THE WORLD'S LARGEST MAKERS OF VISES"
9017 Bessemer Ave. Cleveland, Ohio

(Continued from page 17A)

market a new oscillating spindle sander and grinder for wood and metal finishing, which is recommended to patternmakers for sanding cores and for irregular edge work on either wood or metal patterns. It is also intended for cabinetmakers and school shops where inside- or outside-edge grinding and finishing on metal parts is done.

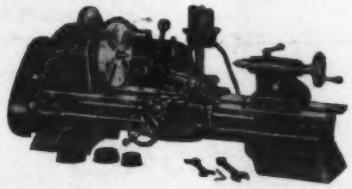
The oscillating spindle carries rubber drums of various diameters to which endless tubelike, abrasive sleeves are mounted by merely expanding the rubber drums.

The machine has a gear-drive chosen especially for long wearing qualities and quiet operation. The maximum clearance of drums above the tilting table is 6 in. A feature claimed by the manufacturer is the ball-bearing oscillating action requiring only occasional lubrication, splash oiling being provided for all other moving parts. A two-way, 20-in. square tilting worktable, is tilted mechanically with crank and worm mechanism, with all angles indicated by a dial and pointer. Both bench and floor models are available.

The firm has prepared a descriptive catalog which will be sent to any school official upon request.

¶ The new back-geared, screw-cutting lathe, just placed on the market by the Atlas Company, Kalamazoo, Mich., is their latest development in the rapidly growing line of metalworking machines for home and school workshops.

This new lathe is a sturdy, precision, machine tool. It was especially designed for jewelry work, modelmaking, and home crafts. It handles such operations as turning, facing, threading, tapering,



boring, knurling, cutting off, and mica undercutting, with speed and accuracy. The lathe swings diameters up to 6 in. and is available in two sizes, one accommodating 12 and the other 18 in. between centers. It is equipped with reversible power feeds for carriage, complete V-belt drive, tapered roller-spindle bearings, and countershaft attached directly to the lathe. It is capable of a range of sixteen speeds and insures permanent accuracy. Complete information is available to any school-shop instructor upon request.

¶ The new tilting arbor saw, just placed on the market by the Walker-Turner Company, Plainfield, N. J., represents a combination of two engineering developments. It has all the advantages of the gear-drive circular saw, and the tilting arbor feature permits the easy handling of unwieldy pieces. Pieces being sawed at any angle are always horizontal and the operation of the saw saves up to 40 per cent of the power formerly wasted on belt-driven saws with small pulleys.

The tilting arbor saw has many other advantages which make it useful in the shop. All slippage is eliminated and friction is reduced to a minimum by the elimination of belts and pulleys.

The annoyance and expense of lubrication, belt adjustment, and replacement are removed. The greatest possible safety for the operator is insured

through the elimination of flying belts and exposed shafts.

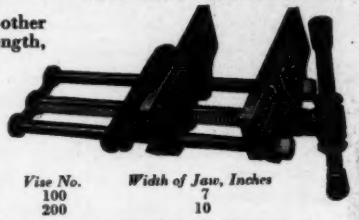
The tilting arbor saw is manufactured in two sizes, 8 in. and 10 in., and with full 2 in. and 3 in. capacity. Complete information is available by writing to the Walker-Turner Company at Plainfield, N. J.

(Continued on page 21A)

MORGAN VISES

Don't cost any more than other vises. Unsurpassed for strength, rigidity and durability they are guaranteed against breakage. Parts broken in service replaced free of charge. If through wear it becomes necessary to replace parts, this is easily accomplished because all parts are interchangeable.

QUICK ACTION VISE
Has unusually effective and durable working action. Screw is 1¼" in diameter. Half nut of high quality bronze with accurately cut threads. Furnished with or without dogs in front jaw.



Vise No.	Width of Jaw, Inches
100	7
200	10

Send for literature on our complete line of vises.

MORGAN VISE COMPANY
120 N. Jefferson Street Chicago, Illinois

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HARDENS INTO WOOD

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We supply everything needed for this fascinating work. Largest assortment of materials at lowest prices. Samples FREE to teachers, camp instructors, etc., who write for same on official letterhead or give connections. Others

SEND FOR SAMPLES ENCLOSE 5 CENTS in Stamps

ART LEATHERS FOR THE LEATHERCRAFT WORKER

Headquarters for Art Leathers, whole or half skins, also cut to measure. Tools, designs, lacings, both in calf and goat skin, snap fasteners to match leathers, leather dye, wax polish, Sphinx Paste, slide fasteners and bag plates. Book on leather work $1.00

Tell us your wants—we'll quote prices.

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"HARD-to-GET" MATERIALS

Cabinet hardware, glue, finishing materials, upholstering fabrics, transfers, electric clock movements, bridge arms, tea wagon wheels and hundreds of other items all at wholesale prices.

Our 23rd Annual Catalog is free for the asking.

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Jobbers and Manufacturers
ANOKA MINNESOTA

Portable Electric Spraying Outfits for Every Purpose

Furnished with our special Non-Clogging Spray Gun. $39.50, $42.50, $79.50, F. O. B. New York City.

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Air Compressors Exhaust Fans, Air Filters, Spray Booths, Artist Spray Guns, Air Tanks, Material Tanks, Air Hose, Hose Couplings, Spray Masks, Strip Tool, Electric Motors, Driving Belts, Check Valves, Regulating Valves, Pressure and Vacuum Gauges, Electric Pressure and Thermostatic Switches, Spray Guns for all types of work from $5.50 up.

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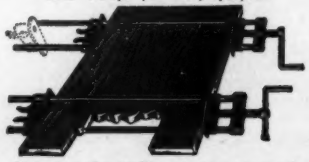
HARTFORD CLAMPS

Hartford Single and Double Bar, Self-Locking and Unlocking Clamps have been standard in most schools for over fifteen years.

Write for free catalog covering hand clamps for every purpose.



Note how the double bars keep the work from buckling.

HARTFORD CLAMP CO.
Bunnlde Connecticut

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IN THE SCHOOL AND HOME WORKSHOP

This book, containing 232 pages—150 illustrations—over 50 completely detailed projects—100 designs, will be of great assistance in planning interesting projects in the newest of craft materials, —the cast resin plastics.

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for Instructors and Students

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DON'T PUT IT OFF . . . WRITE TODAY!

CABINET MFG. CO.
QUINCY, ILLINOIS
Est. 1901

(Continued from page 19A)

¶ The light, quick clamp, No. 494, manufactured by the Cincinnati Tool Company, Cincinnati, Ohio, is a handy tool for use in furniture construction, pattern work, light cabinetwork, and the school workshop. It weighs less than one pound, can be instantly applied or removed from the work, will not slip under pressure nor stick when pressure is released. These

clamps have movable frames, stationary feet, and wood handles on the screw. They are made in six sizes.

The No. 494 clamp sells at a very moderate price. Complete information is available upon request.

Change of Name

¶ The Manley Products Corporation, State and Hay Sts., York, Pa., has announced a change in its name to The Remco Products Corporation.

New Trade Catalogs

¶ Everything you need in a modern metalworking lathe is supplied in the modern Atlas lathe, manufactured by the Atlas Press Company, 1819 N. Pitcher St., Kalamazoo, Mich.

The firm's latest metalworking catalog lists and describes lathes, drill presses, arbor presses, and shapers. Two new machine tools are included, one a shaper with a 7-in. stroke, and a back-geared, screw-cutting lathe with a 6-in. swing. Complete information is available by any shop instructor upon request.

¶ The Atlas Press Company, Kalamazoo, Mich., in its new Catalog No. 28 on Atlas Shop Equipment, indicates the changes made by the company in adapting automotive-line production methods to the manufacture of shop equipment.

The catalog describes the company's complete line of shop equipment, including shapers, lathes, grinders, disk sanders, drill presses, hydraulic presses, machinists' vises, woodworkers' vises, heavy-duty motors, heavy-duty grinders, wood lathes, and accessories. A copy of the catalog will be sent to any school shop instructor upon request.

¶ "How to Select and Use Wrenches" is the title of a 27-page booklet just issued by the J. H. Williams Company, 75 Spring St., New York City. It contains a description of the characteristics of carbon and alloy steel wrenches.

The booklet explains how to select open-end wrenches, and adjustable wrenches; how to use them safely and efficiently. There are photographs and descriptions of the firm's line of railroad and general wrenches, and wrenches for automotive work.

¶ "Shop-tested Power Tools" is the title of the new catalog N-1, just issued by the Boice-Crane Company, Toledo, Ohio. This catalog of 43 pages describes the Boice-Crane line of shop tools for industrial shops and homecraft shops and lists tilting arbor saws, motor-driven individual saws, saw jointers, spindle sanders, jig saws, spindle shapers, and band saws, together with equipment and accessories for woodworking, metalworking, and accessories for metalworking jobs.

A copy of the catalog will be sent to any school-shop instructor upon request.

¶ The new Skilsaw Catalog No. 38 presents the complete Skilsaw line — each tool a combination of advanced engineering refinements, precision construction, and fine materials. The money-saving value of Skilsaw tools results not

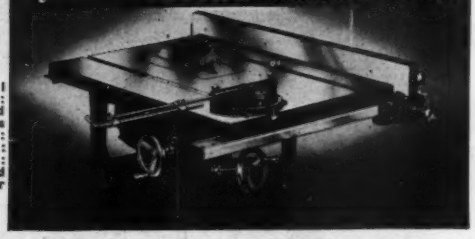
only from their adaptability to production work but also from their many uses in the shop and in maintenance work.

The catalog lists and describes handsaws, drills, grinders, belt sanders, disk sanders, floor sanders, and blowers. A copy will be sent to any school-shop instructor who will write to the Skilsaw Company at 3310 Elston Ave., Chicago, Ill.

THE 1938 BOICE CRANE

Everything for Manual Training Shops! Saws : Jointers : Jig and Band Saws : Low Cost Thickness Planers : Spindle Sander : Belt Sander : Grinder : Drill-Mortiser : Lathes : Metal Spinning Tools : and the new sensational floor model Shaper.

New TILTING ARBOR SAW



On any and all comparisons the new 1938 BOICE-CRANE machines rank first as the logical choice for today's school shops. Handsome is the only word describing their good looks. Modern and up-to-date features galore that only BOICE-CRANE offers. Hair-splitting accuracy! Rugged! Surprisingly low priced!

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18 Models for Woodwork only
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224 S. Jefferson St. Chicago, Ill.

Wood Carving Made Easy

By J. I. Sowers

A new book on an old subject, simplifying the art for beginners. Profusely illustrated.

$1.25

THE BRUCE PUBLISHING CO.
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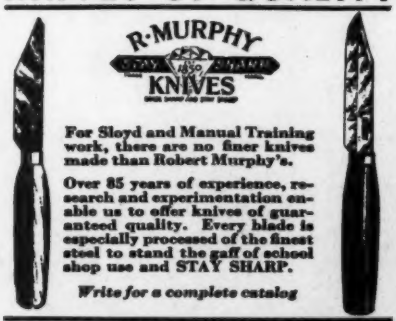
KNIVES OF QUALITY



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Over 85 years of experience, research and experimentation enable us to offer knives of guaranteed quality. Every blade is especially processed of the finest steel to stand the gaff of school shop use and STAY SHARP.

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